

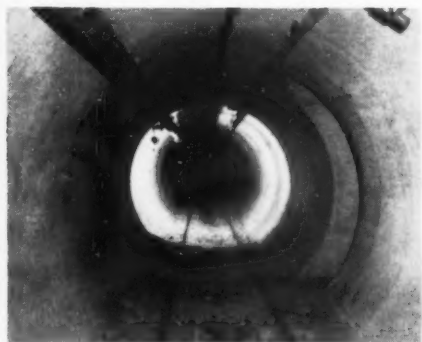
MINING WORLD

October 1960

How Hanna Smelts

low-grade Oregon lateritic nickel ore
by Uginex process in electric furnaces

► 33



San Manuel Concretes

underground mine openings for lowest cost
ground support in this block-cave mine

► 38

Philex Pits Philippine

copper-gold ore from steep mountain side
south of Baguio's famed gold mines

► 50

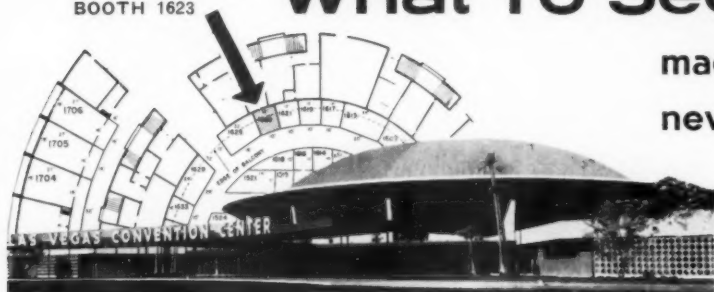


MINING WORLD
BOOTH 1623

What To See at Las Vegas

machinery exhibit where all the
new machinery will be displayed

► 59

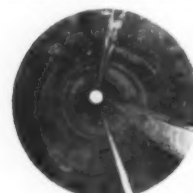




Study of specifications and detail engineering.



Excavation for shaft collar.



Completed 700' shaft, concrete lined.



Crew readying for underground blast.



Underground control center.



Equipment lowered underground, readied for start-up.



Ready to go!

WKE

GOES UNDERGROUND

FOR U. S. GYPSUM

SPECIFICATIONS:

- 8' Air Shaft, 616' deep, concrete lined.
- 15' Mine Shaft, 700' deep, steel and concrete lined.
- Mining System . . . room and pillar with shuttle cars.
- All underground crushing and mining equipment.
- Electrical control center.
- Start-up operations.

STEP BY STEP:

Sound, cost-saving mine development and construction by W K E . . .

- Consultation
- Economic and feasibility studies
- Geologic studies
- Planning and budgeting
- Surveying and sampling programs
- Mine layout and engineering
- Shaft sinking and mine development

Consult the men of W K E for an economic, realistic approach to mine development problems. Ask for more information.

W K E

® WESTERN KNAPP ENGINEERING CO.
SAN FRANCISCO • New York • Chicago • Hibbing
Building for the Future—in a World of Industries



Specify
**SANDVIK
COROMANT
ROPE-THREAD**
bits and steels

...for quick hand uncoupling!

No, it's not child's play, but the fact is you can uncouple Sandvik Coromant Rope-Thread bits and steels by hand! Smooth, shallow-depth, rounded threads with a pitch of just 2 turns per inch prevent binding. You'll have fewer thread failures too, compared with "saw-tooth" thread designs. What's more, only the threads are hardened, so you can re-thread steel sections without heat-treating. And, with faster uncoupling, you'll drill more feet per shift!

Coromant bits and steels have many other advantages, too: Better quality carbide (Sandvik is one of the largest manufacturers of carbide in the world)... better, more rigid steel...superior workmanship... all add up to above-average bit and rod life, up to double the footage between sharpenings, and straighter, cleaner holes.

Want proof? Easy! Call us and we'll arrange for a demonstration and test on your job. Write us today. Address: Dept. MW-11.

Atlas Copco

545 Fifth Avenue, New York 17, N.Y.

610 Industrial Avenue
Paramus, New Jersey
COlfax 1-6800

930 Brittan Avenue
San Carlos, California
LYtell 1-0375



BLASTING IS OUT— D9 AND RIPPER IN— PRODUCTION

UP 35%

Gillen Coal Mining, Inc., is salvaging a six-ft.-thick seam of coal near Carbondale, Pa. To get to the coal, 180 ft. of overburden must be removed—10 ft. of topsoil, 100 ft. of hardpan and, finally, 70 ft. of rock.

Gillen used to blast through. Then they changed to a Caterpillar D9 Series E Tractor with a No. 9 Ripper. Production shot up 35%. Cost savings are estimated to be 60%!

The overburden, rough as it is to work with, is the kind of material the D9 and No. 9 Ripper eat up. Working in 50-ft. passes, the team fragments the hardpan (average cu. yd. weight 3200 lb.) into right-size pieces for two Cat DW21s. They're moving up to 4000 yd. a seven-hour shift. When needed, the D9 pushloads the scrapers and 'dozes, too.

The D9 and No. 9 is an all-business combination of power and speed. The Series E Model D9 has a 335 HP (flywheel) turbocharged engine to put massive power into the work. You get more power from every gallon of fuel. The Series E D9 has a heavier undercarriage. Track components are bigger, heavier. You get up to 40% more

life with deeper hardened steel shoes, links and rollers. A new equalizer bar makes the Series E D9 even more stable.

New power shift transmission gives you the flexibility and anti-stall features of a torque converter with the split-second snap of direct drive. Finger-tip control gives operators instant changes under full load without clutching.

Match this with the No. 9 Ripper to break your way through production bottlenecks. For the right tractor-ripper combination, see your Caterpillar Dealer, who will prove his recommendation with a demonstration.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**WANTED—
THE HARD WORK**



Hanna Smelts low grade Oregon lateritic nickel ore in electric furnaces by Ugine process. Ferrosilicon reduces nickel in molten oxide ore to produce a ferronickel alloy, 46 percent nickel and 52 percent iron 33

San Manuel cuts mining costs with concrete to reduce underground support costs. Special mechanized equipment now positions prefabricated steel forms 38

Exclusive Report on diamonds in Africa. What companies mine diamonds, where their mines are located, average recovery in carats per unit mined, and the average ratio of concentration 44

Philex Operates open pit copper-gold mine in rugged mountains south of famous Baguio gold district. Heavy rains slow but don't stop this new mine 50

Welcome Miners says Vegas Vic to the AMC machinery exhibit. What to see and where to go for Day time Sun and Night time Fun 54

Technical Program features speakers from major mining companies 56

Exhibit Preview lists all manufacturers and describes their products. A special and exclusive list gives names of all sales engineers who will help you find out all about their equipment 59

WHAT'S GOING ON IN MINING

Central and Eastern	78	Southwest	83
Iron Ranges	80	Northwest	91
Rocky Mountain	87	International	94

DEPARTMENTS

Drifts and Crosscuts	5	Men Who Make News	75
Capitol Concentrates	7	Metal and Mineral Prices ...	70
Advertiser's Index		110	

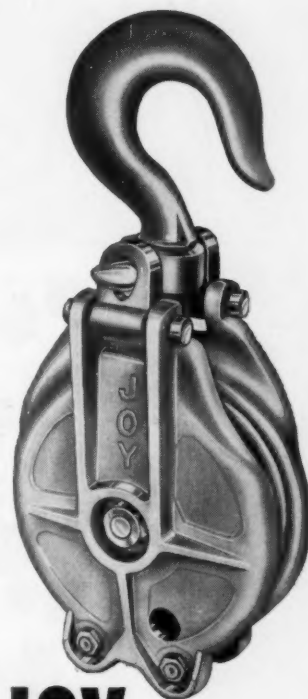


MILLER FREEMAN PUBLICATIONS



MINING WORLD, October, 1960. Volume 22, No. 11. Published monthly except April, when publication is semi-monthly at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 500 Howard Street, San Francisco 5, California. Subscription in United States, North Central and South America, \$4.00 per year; other countries, \$5.00 per year. Entered as second class matter Oct. 10, 1951 at the Post Office at Bristol, Conn., under act of March 3, 1879. Postmaster, please send notice 3579 to MINING WORLD, 500 Howard Street, San Francisco 5, Calif.

OCTOBER 1960



JOY quick opening SHEAVE BLOCKS

forged construction

The hook and side plates of the 6", 8" and 10" sizes are *forged alloy steel*. The wheel is chrome-nickel-moly cast steel. All parts are heat-treated for strength and wear resistance.

simple & rugged

There are no pins, chains, bolts or nuts to handle or remove. TO OPEN JUST TURN AND PUSH . . . no parts leave the block to become lost. The rugged opening mechanism will last for the life of the block.

Write for Bulletin 287-8

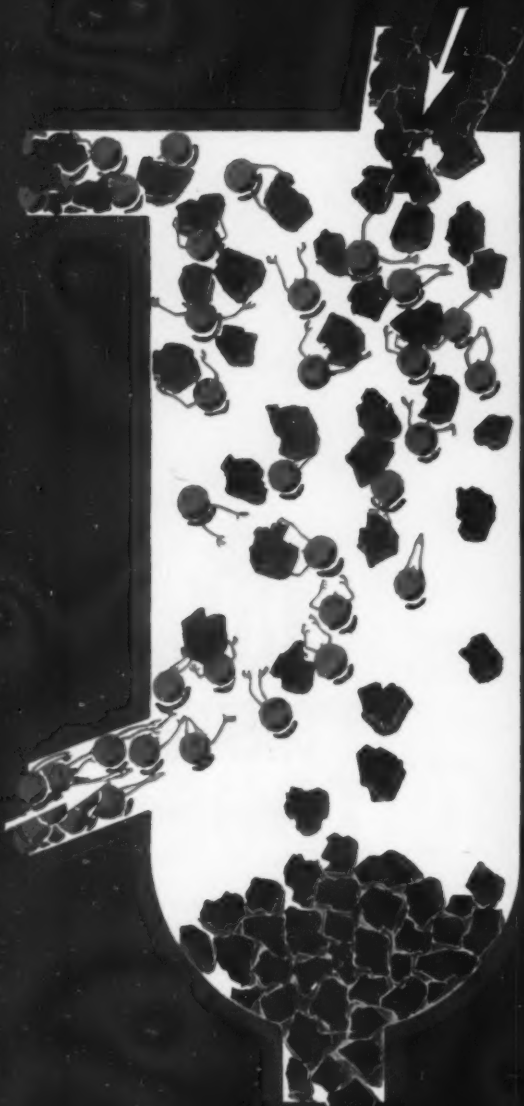
JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company
(Canada) Limited, Galt, Ontario

KNAPSACK-FERROSILICON 15% ATOMIZED

FOR HEAVY MEDIA SEPARATION



Helps reduce costs and increases operating efficiency by:

1. Reducing corrosion

The spherical shaped particles of atomized ferrosilicon offer maximum resistance to corrosion due to their smooth, hard surface. There are no sharp-edged corners which are particularly susceptible to rusting.

2. Reducing „drag-out“ or adhesion losses

Atomized ferrosilicon particles are easily separated from the ore and gangue by spraying on the rinsing screens, eliminating high losses due to adhesion.

3. Reducing pulp viscosity

The ball-to-ball contact of the atomized ferrosilicon particles minimizes mutual adhesion, reducing the pulp viscosity.

Because of the reduced pulp viscosity, the feed can be increased to give a more dense pulp for sharper separations. Specific gravities up to 3.9 are attainable.

4. Reducing wear on equipment

Atomized ferrosilicon, due to its rounded surface, materially reduces wear on pumps, piping, etc.



KNAPSACK-GRIESHEIM

AKTIENGESELLSCHAFT

WERK KNAPSACK · KNAPSACK BEI KÖLN



U. S. DISTRIBUTORS:

HOSTACHEM CORPORATION

350 FIFTH AVE., N. Y. 1, N. Y.

MINING WORLD

EDITORIAL AND EXECUTIVE OFFICES

500 Howard Street
San Francisco 5, California
EXbrook 7-1881

Sales Manager H. G. Grundstedt
Editor George O. Argall, Jr.
Field Editor John R. Bogert
News Editor Janet M. Taylor
Production Manager Janet M. Taylor
Circulation Manager C. C. Baake
Field Circulation Mgr. C. S. Denny

New York City Office
370 Lexington Avenue
New York 17, New York
Murray Hill 3-0295
District Manager Stanley H. Dayton

Chicago Office
1791 Howard Street
Chicago 26, Illinois
Rogers Park 4-3420
District Manager Norman C. Ek

Vancouver, B. C. Office
402 Pender St. West
Vancouver, British Columbia, Canada
MUtual 5-7287
Cable Address: MILFREEPUB
Associate Editor Charles L. Shaw

United Kingdom Office
130 Crawford Street
(Corner Baker Street)
London, W. 1, England
WELbeck 3624
Cable Address: MILFREEPUB
Manager, United Kingdom Office
Bernard W. Lansdowne
Advertisement Manager ... Derek Hopkins

Continental European Office
28 Attendorfer Street
Köln-Merheim
West Germany
Telephone: 87-17-52
Cable Address: MILFREEPUB
Director, Continental European Operations
Dr. Walter F. Vogeno

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia; Kalulushi, Northern Rhodesia; Kampala, Uganda; Rabat, Morocco. Asia—Ankara, Turkey; Ipoh, Malaysia; Bombay, India; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. Europe—London and Redruth, England; Vienna, Austria; Stockholm, Sweden; Oslo and Trondheim, Norway; Paris, France; Madrid, Spain; Köln-Kalk (Cologne), West Germany; Rome, Italy. North and Central America—Vancouver, British Columbia; Mexico, D.F., Mexico. Oceania—Port Kembla, Australia; Manila, Republic of the Philippines; Bandung, Indonesia. South America—Lima, Peru; La Paz, Bolivia; Buenos Aires, Argentina; Santiago, and La Serena, Chile; Sao Paulo, Brazil.

Not responsible for unsolicited manuscripts. Contents may not be reproduced without permission.

Published by Miller Freeman Publications
Wm. B. Freeman, President
Miller Freeman, Jr., Exec. Vice-President & Treas.

SUBSCRIPTION RATES:
U.S., North, South and Central America\$4.00
Other Countries\$5.00
Single Copies\$.50
Directory Number\$1.00

CHANGE OF ADDRESS:
Send subscription orders and changes of address to MINING WORLD, 500 Howard St., San Francisco 5, Calif. Include both old and new addresses and zone numbers.

Copyright 1960 by Miller Freeman Publications, Incorporated

DRIFTS AND CROSSCUTS

Thanks Manufacturers

Bigger equipment, more equipment, and new equipment continue to be the trend in the minerals industries. They all mean lower cost; and lower cost is the only answer to mining lower grade ores.

No less than 48 manufacturers have new pieces of equipment scheduled for exhibition at the Metal Mining Show and Machinery Exhibit scheduled for October 10 through 13 at Las Vegas, Nevada. A complete description of all equipment to be exhibited appears in the special section of this issue.

MINING WORLD joins the mining companies in thanking the equipment manufacturers for their many equipment developments for mining and metallurgy.

Convention Craze

Yes, it's physically possible in today's jet travel age. What's possible? Attendance at the seven mining conventions, symposiums, machinery exhibits, and regional meetings to be held by and for the benefit of mining, geological, and metallurgical engineers during the first three weeks of October.

It's most doubtful if it's economically feasible or technologically practical for any engineer to attend several of these conventions, let alone all of them.

Is the mining industry trying to outdo the oil and gasoline industry? When one oil company builds a filling station on one corner of a road intersection, it's a fast rush to find out which other three oil companies can build on the three other corners.

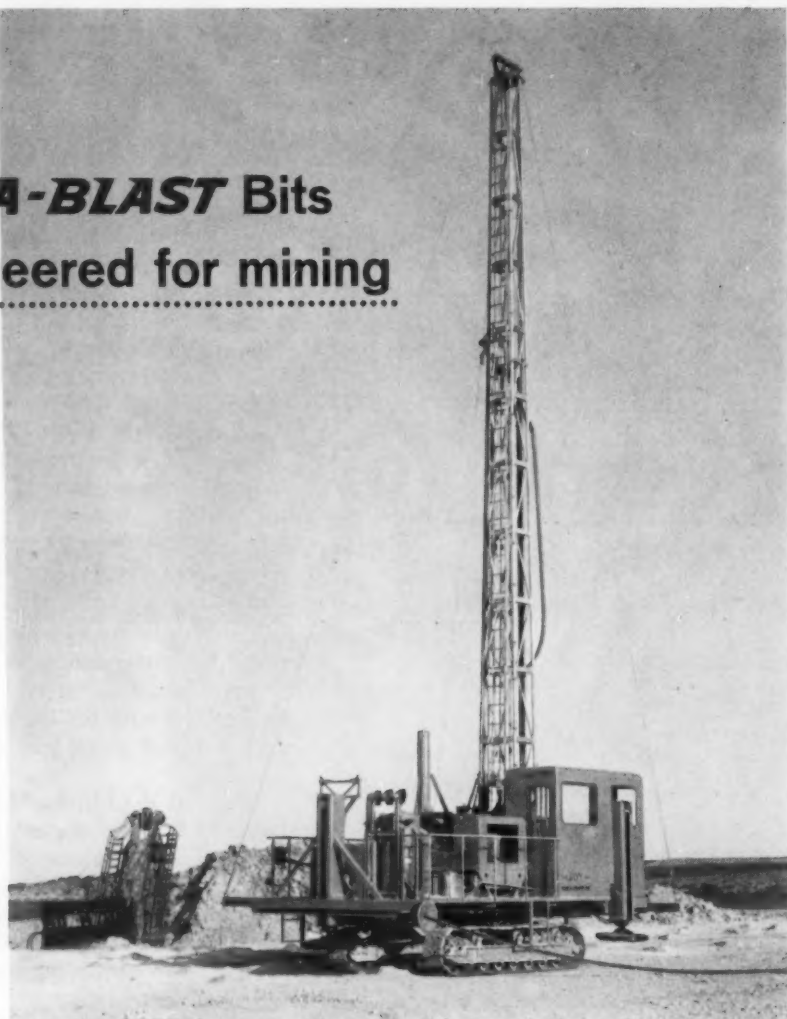
It looks like the mining industry is trying to do the same thing. When there's one convention the idea seems to be to have six or eight simultaneous or slightly overlapping conventions.

Why? No one knows for sure. Perhaps it all started years ago, before jets, to follow a pattern of travel from the western mining districts. The AIME scheduled its annual New York meeting so that engineers could continue to the east after the Colorado Mining Association Convention. The AIME's Rocky Mountain Minerals Conference was set to precede the meeting of the American Mining Congress.

Here's where you would have to go to attend these eight conventions. September 30, Birmingham, Alabama, AIME; October 5, Lafayette, Indiana, National Clay Conference; October 6, Salt Lake City, Utah, Rocky Mountain Minerals Conference, AIME; October 10, Las Vegas, Nevada, AMC Machinery Exhibit; October 17, Tucson, Arizona, University of Arizona Open Pit Symposium; October 18, Golden, Colorado, Colorado School of Mines Drilling Symposium; October 19, Chicago, Illinois, Mining Section of the National Safety Congress.

It looks like it's time for the industry to stop, take a look, and reevaluate conventionitis. As it is now it's good for the air lines and hotels.

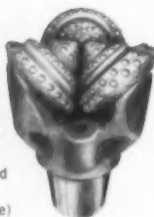
HUGHES *ROTA-BLAST* Bits are engineered for mining



ROTA-BLAST

RG-2JS

For extremely hard
abrasive rock
(Taconite, quartzite)



ROTA-BLAST

W7R

For hard rock
(Siliceous limestone,
dolomite, sandstone,
granite)



ROTA-BLAST

OW

For medium rock
(Limestone, sandstone,
sandy shales)



ROTA-BLAST

OSC-1G

For soft formations
(Calcite, shale, clay)



Hughes "Rota-Blast" rock bits and rotary drilling techniques, developed in close co-operation with operators and drill manufacturers, are increasing footage and penetration rate 100% and more in areas where blast hole drilling is the toughest.

Hughes offers a complete line of "Rota-Blast" rock bits — each engineered for fast, economical blast-hole drilling in specific formation for which it is designed.

Your Hughes representative can recommend the "Rota-Blast" bit best suited to your operation, and is also qualified to offer you assistance in your drilling program. Behind his recommendations and the bits he sells are the world's largest rock bit manufacturing plant and more than a half-century of specialized rotary rock bit experience.

HUGHES

industrial products

HUGHES TOOL COMPANY • HOUSTON, TEXAS

CAPITOL concentrates

GOVERNMENT ACTION AND REACTION AFFECTING MINING



Congress's Mineral Record Is Far From Impressive . . .

The 86th Congress has adjourned and the record shows scant accomplishment in the field of minerals.

The lead-zinc subsidy bill went down before a Presidential veto; the lead-zinc tariff measure never came to a vote; and many other proposals died in committee. One measure which would have established a national minerals policy was passed by the Senate in 1959, assigned to the House

Interior Committee, but never reported out by that body.

Sponsors of minerals legislation have already served notice that the 87th Congress will be in for some intensive lobbying. Lead and zinc, manganese, tungsten, titanium, fluor spar, cobalt, and mercury producers can be expected to start an early drive for government subsidies or tariff legislation. Passage of the lead-zinc subsidy

bill (despite the Presidential veto) was a big victory and will encourage renewed efforts by mineral producers.

A major fight can be expected when the 87th Congress takes up renewal of the Reciprocal Trade Agreements Act—due to expire in 1962. One of the big issues will be adequate protection of domestic producers from injury from foreign imports—and in that particular fight the mineral producers will have lots of help from many other branches of United States industry. ■

President Vetoes Small Mines Lead-Zinc Bill . . .

As predicted, President Eisenhower vetoed the lead-zinc subsidy bill designed to assist the small lead and zinc mines.

The measure, known as the Edmondson bill (H. R. 8860), had passed the Senate on August 19 by a vote of 59 to 28. It called for stabilization payments to small domestic producers to give them a return equal to what they would receive if the market price for zinc were 14.5 cents a pound and for lead 17.0 cents a pound. Small domestic producers were defined as those who produced not more than 2,000 tons of lead and/or 2,000 tons of zinc from a single mine in a year. Benefits also were to be limited to producers who had produced at or below the allowable level for a year or more. In addition, the domestic producer was to be treated as a small domestic producer with respect to only one operating unit in any one state or mining district.

The cost of the subsidy had been estimated at about \$4,500,000 annu-

ally and was to be financed by an annual appropriation which could not exceed \$4,800,000 a year.

The measure had been opposed by both the Department of the Interior and Department of Commerce during committee hearings. They stated that the government already is assisting the industry through quotas on imports of lead and zinc. The Commerce Department added that, in its opinion, "subsidization serves to perpetuate marginal and submarginal operations which are uneconomic in nature and which therefore become a drain on the economy." The Interior Department objected on the basis that subsidies would tend to decrease the prices received by other producers and thereby penalize those mines not covered by provisions of the bill.

In his veto message President Eisenhower stated the bill had three "fatal defects." First, it would "intensify the industry's problems by generating substantial additional production at

the expense of other miners' jobs" and the increased output "could depress lead and zinc prices and thus cause cutbacks and lay-offs of mine workers in the unsubsidized mines." Next, the subsidies "would complicate, even frustrate," government programs now in effect aimed at achieving "a world-wide balance of production and consumption." And lastly, the subsidies "would generate demands for equal treatment and similar subsidies from other producers of lead and zinc as well as producers of many other minerals."

The president noted that as a result of the 1958 quotas which he had imposed, and continuing international cooperation, "the volume of imports is at the lowest levels and constitutes the smallest percentage of total lead-zinc in supply in nearly a decade." While acknowledging that consumption of the two metals has been at disappointing levels, he expressed the belief that the domestic industry "should, with increased demand, again move rapidly to normal and stable operation at reasonable prices." ■

Beryl and Asbestos Now Eligible For Exploration Loans . . .

Applications will now be considered for assistance in exploration for all types of beryllium-bearing ores and for nonstrategic as well as strategic types of asbestos, according to an announcement by the Office of Minerals Exploration. Under earlier regulations,

only beryl and the strategic types of asbestos were eligible.

The following metals and minerals are on OME's current list: Antimony, asbestos, bauxite, beryllium, cadmium, chromite, cobalt, columbium, copper,

corundum, industrial diamonds, fluor spar, crucible flake graphite, strategic kyanite, lead, manganese, mercury, strategic mica, molybdenum, monazite, nickel, platinum group metals, piezoelectric quartz crystal, rare earths, rutile-brookite, selenium, block steatite talc, tantalum, thorium, tin, uranium, and zinc. ■

Gold Outflow Continues Faster From United States . . .

Better interest rates abroad are responsible for the increased foreign withdrawals of gold from the United

States and now even from Canada. The Bank of Nova Scotia recently flew over 15 tons of gold (worth about

\$17,000,000) from Toronto to the U. S. Federal Reserve vaults in New York. No announcement was made concerning the ownership of this vast amount of gold. ■



Bucket Wheel Excavator

At the 1960 Mining Show, Las Vegas, on Spaces No. 45, 72, 74, and 76 in the Outside Exhibit Area,

FRIED. KRUPP MASCHINEN- UND STAHLBAU RHEINHAUSEN will show a small bucket wheel ex-

cavator, Type Sch Rs $\frac{100}{0.4} \times 9.5$, for an output capacity up to 470 cu. yds. of loose material per hour.

Bucket wheel excavators are continuous duty equipment assuring a steady flow of excavated material.



The digging tool is a wheel which, in the present type, has seven buckets attached to its circumference. Bucket content is 3.5 cu. ft. each.

This bucket wheel only does the actual digging work, while further haulage of material up to the loading point is done by means of economically working conveyor belts.

A switch gear will permit selection between two speeds for bucket wheel rotation.

The bucket wheel boom and loading boom can be slewed independently. Bucket wheel boom is raised or lowered hydraulically.

This type of excavator, with the rotating wheel slewable in generally horizontal plane, is suited especially well for digging of stratified materials. Whereas bucket wheel excavators were first used mainly in open cast mines for mining and digging of overburden and minerals, they can now be seen already on the most various excavation sites, working on removal of elevations, digging cuts, canals, or basic layouts for roads and railroads.

The excavator shown here can cut in a width of 47 feet per block, at a cutting height of 31 feet. The excavator is fully electrified. It travels on two crawlers, at a speed of 20 feet per minute. Altogether, nine drive motors are installed, with a total power rating of 138 kW.

Versatility in operation and low operating cost are the predominant characteristics of this excavator.

KRUPP excavators and bulk handling plant are working all over the world, under the most severe climatic conditions—in Canada and South Africa, in the United States, Australia, India, Indonesia, in the Congo or Morocco, in Greece and Yugoslavia, Italy, France, England, Ireland, Poland, Russia and Germany.

◀ Crawler track assembly for bucket wheel excavator. Each crawler driven separately.

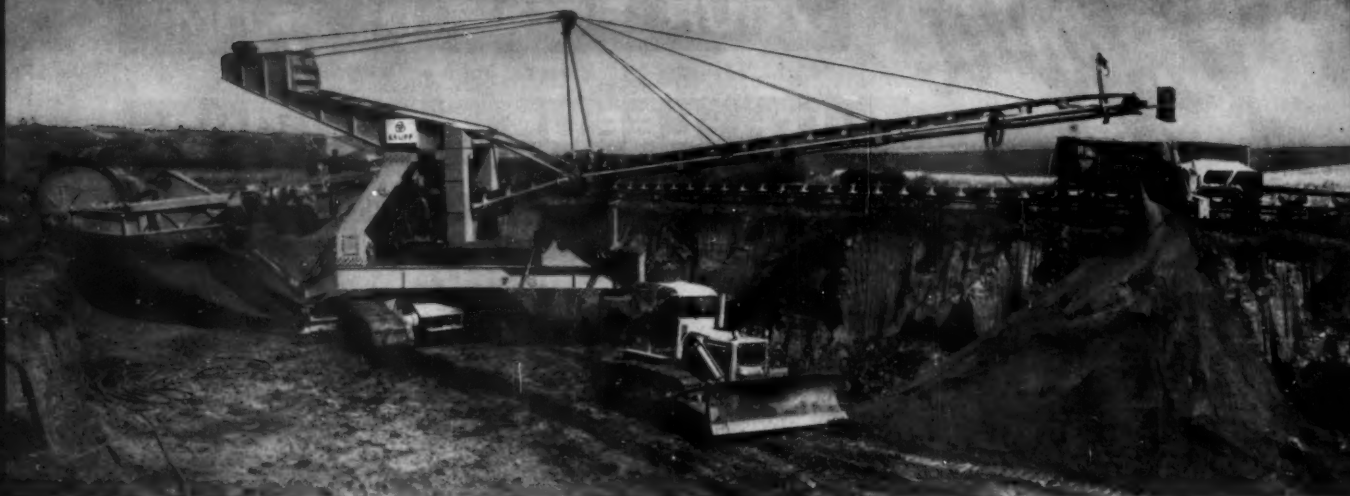
◀ Bucket wheel is equipped with seven buckets. A switch gear permits selection between two speeds for wheel rotation.

▼ Bucket Wheel Excavator, Sch Rs $\frac{100}{0.4} \times 9.5$, digging a cut





KRUPP



We advise

on all projects involving mining of materials and their transportation. We design complete surface and underground mining schemes and the necessary mechanical equipment based on the manifold experiences of our mining, excavation and conveyor engineers.

We design,

manufacture and erect excavators, either rail or crawler mounted, for mining, canal and dam construction, etc., such as bucket chain excavators, bucket wheel excavators, loaders, spreaders, stackers, special equipment, complete bunkering plants, conveyor bridges, stationary and movable conveyors.

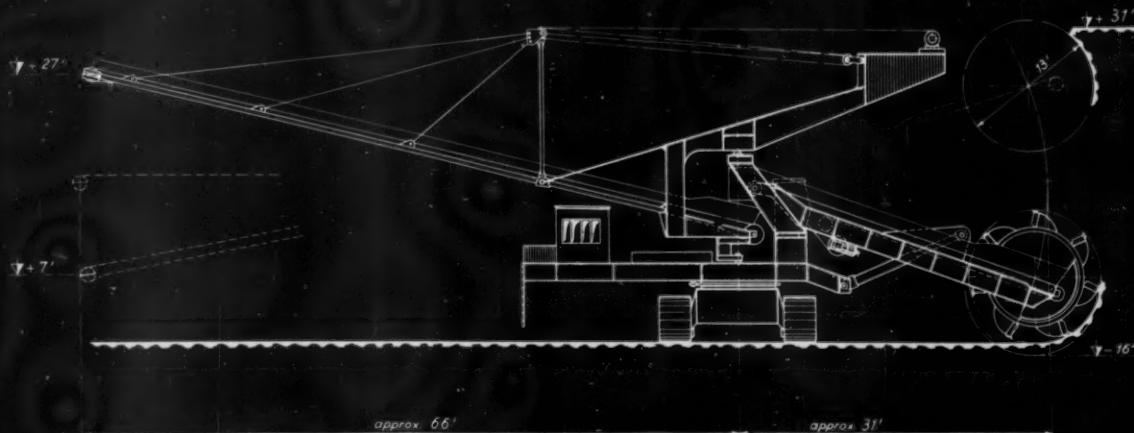
KRUPP Bucket Wheel Excavator Type Sch Rs $\frac{100}{0.4} \times 9.5$

for a theoretical capacity up to 470 cu.yds/hr. Excavator is fully electrified. Bucket wheel boom and loading boom slewable independently.

Come and see this bucket wheel at the 1960 Mining Show, held by the American Mining Congress at Las Vegas, Nevada, October 10-13, 1960, in Spaces No. 45, 72, 74, and 76 of the Outside Exhibit Area.

FRIED. KRUPP MASCHINEN- UND STAHLBAU RHEINHAUSEN · GERMANY

For information, please contact Krupp International Inc., 375 Park Avenue, New York 22 N. Y.



Introducing a new service to the Mining Industry!

Rebuild

YOUR PRESENT DRUM

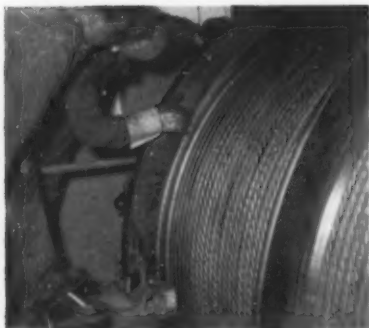
at your mine site

WITH LEBUS GROOVING

and at the same time obtain LeBus Controlled Spooling for multilayer spooling operations

See movies
of these operations
at LeBus Booth,
Las Vegas Mining Show
October 10th
to 14th

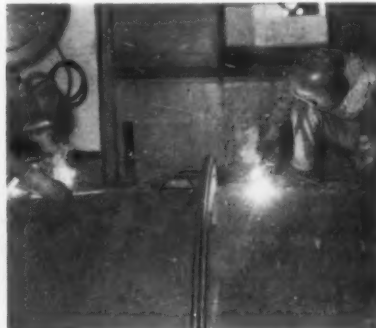
- Change your cast iron drum core and flanges to steel
- Change groove size for larger lines when going deeper
- Increase wire line service over any present multilayer spooling
- Eliminate cutting through of line and excess scrubbing at the crossovers



(1) This view shows one method of removing tapered wedges or end fillers on helical grooved cast iron drum.



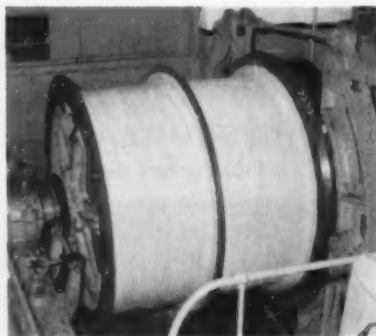
(2) Shows process of drilling a steel sleeve to be bolted to a cast iron drum.



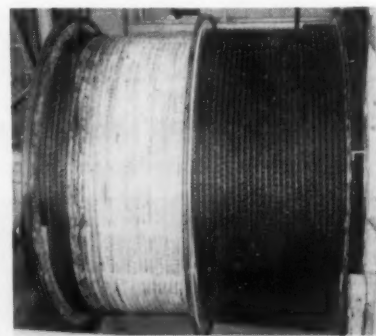
(3) Shows installation of steel sleeves and steel wear plates on the flanges and welding the sleeves and plates firmly together giving a complete steel drum core and flanges.



(4) Shows installation of LeBus grooved segments to the steel drum core by the process of welding.



(5) Completed installation showing LeBus Counterbalance Spooling System installed on a 72" by 36" double drum for 1-1/4" line.



(6) View shows overwind and underwind spooling operation where 3 and 1/2 layers of 1-1/4" line are being spooled on to the drum.

Five more skips per hour have been made possible by installation of this LeBus Counterbalance Spooling.



LEBUS INTERNATIONAL ENGINEERS, INC.

Box 2352, Longview, Texas

Phone: Plaza 8-5522

Fairmont Machinery Company
P. O. Box 992 Telephone: 1672
Fairmont, West Virginia

Salmon and Company
P. O. Box 2388 FAirfax 4-0625
Birmingham, Alabama

Western Machinery Company
P. O. Box 1498 CHapel 2-1983
Grand Junction, Colorado

Western Machinery Company
P. O. Box 2548 INgersoll 2-1983
Salt Lake City, Utah

For carloads or small lots

Nineteen convenient smelters and refineries

ASARCO: Buyer, smelter, refiner of gold, silver, lead, copper and zinc ores and blister copper, concentrates, mattes and residues. Fifteen domestic and four Mexican plants located for maximum accessibility as follows:

LEAD SMELTERS

Selby, California
Leadville, Colorado
East Helena, Montana
El Paso, Texas
Chihuahua, Chih., Mexico

ZINC SMELTERS

Amarillo, Texas
Corpus Christi, Texas
Rosita, Coah., Mexico

COPPER SMELTERS

Hayden, Arizona
El Paso, Texas
Tacoma, Washington
San Luis Potosi, S.L.P., Mexico

LEAD REFINERIES

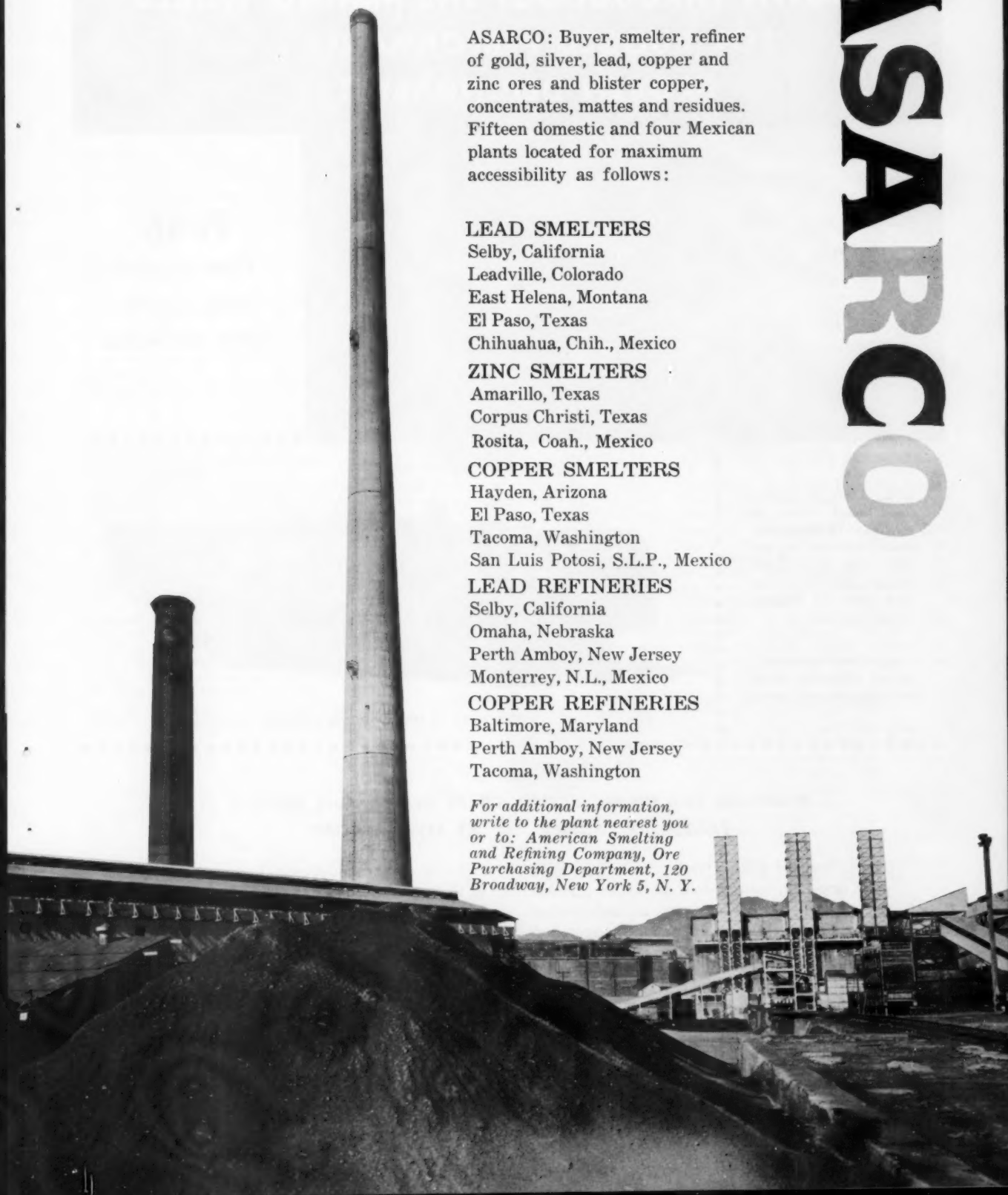
Selby, California
Omaha, Nebraska
Perth Amboy, New Jersey
Monterrey, N.L., Mexico

COPPER REFINERIES

Baltimore, Maryland
Perth Amboy, New Jersey
Tacoma, Washington

*For additional information,
write to the plant nearest you
or to: American Smelting
and Refining Company, Ore
Purchasing Department, 120
Broadway, New York 5, N. Y.*

ASARCO



SCOOT-CRETE

**KNOWN THROUGHOUT THE MINING WORLD
FOR RUGGED PERFORMANCE . . .
PROVEN DEPENDABILITY!**



First,
**WITH MINERS
WHO KNOW
THEIR BUSINESS!**

SCOOT-CRETE CD-4, shown being loaded in mine, will carry up to 15 tons payload. Model CD-3N has 5-ton payload. Note driver's side-mounted position for maximum vision and efficiency, forward and rear.

ALL MODELS APPROVED
BY U.S. BUREAU OF MINES
FOR UNDERGROUND MINING



MODEL KD-5 — 15 TON CARRYING CAPACITY

**Wherever Ore Moves, SCOOT-CRETE Ore Carriers Move It
FASTER • EASIER • AT LOWER COST**

Throughout the mining world, SCOOT-CRETE gives top-rate, trouble-free performance. No rails needed, no ties, no cars, no independent power source. Diesel-powered for operation inside the mine, SCOOT-CRETE carriers are

made for rugged around-the-clock service; carry up to 15 tons at speeds to 15 mph, climb grades up to 18%. Available with standard or fully automatic transmission. SCOOT-CRETE has equal speeds forward and reverse for fast shuttle service.

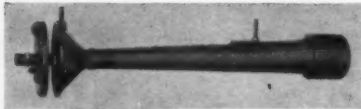
**GETMAN
BROTHERS**

Units available from 3,000 lb. to 15-ton capacity. Write for specifications and literature. **SEE YOUR DEALER!**

SOUTH HAVEN 5, MICHIGAN



How to select an industrial burner to meet your individual requirements



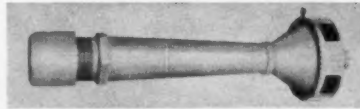
INSPIRATOR GAS BURNERS

(high pressure type)

Applications: Designed for use where natural or manufactured gas is available under 2 to 25 PSI. These burners are economical at low cost for boilers, dryers, heaters, incinerators, industrial furnaces, kilns, petroleum processing and roasters.

Features: Gas energy used to inject combustion air; eliminates costly blower equipment. Adaptable to open port, sealed-in-wall or controlled secondary air firing. Offers flexibility, ease of control and efficient operation through simple, accurate construction. Adaptable for combustion safeguards.

Capacities: Nine sizes: from 80 to 24,000 cubic feet of gas per hour.



INSPIRATOR GAS BURNERS

(low pressure type)

Applications: This series supplements the high pressure inspirators where limited heat input per burner is required. Designed to burn all types of gas under low pressure. Applicable to dryers, industrial furnaces, preheaters and portable units.

Features: Inspiring effect of the throat induces sufficient combustion air. Simple, efficient, easy to control, eliminating costly blower equipment.

Capacities: Six sizes, from 4 to 420 cubic feet of gas per hour under pressures from 4" water column to 12" water column.



CENTRIFUGAL MOTOR BLOWERS

Applications: The low pressure double inlet and the 16-oz. positive pressure single inlet series are used as source of

combustion air for industrial burner systems.

Features: Low pressure blowers meet needs for smooth, quiet, inexpensive operation. 16-oz. positive pressure blowers create high discharge pressure, needed for a large turn down ratio and high efficiency.

Capacities: Low pressure series range from 100 CFM to 800 CFM. 16-oz. blowers range from 90 CFM to 1100 CFM.

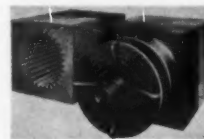


PORTABLE TYPE GAS BURNERS

Applications: Two models: one for intermittent, high output. The other is designed for moderate continuous operation. Applications: heating ladles, heating for bending or forming, firing small furnaces and portable benchwork.

Features: These burners are easily handled and weigh only 20 pounds each, including the low pressure gas burner, DFC motor blower and stand. Portable burners can be supplied with a rheostat for motor speed control.

Capacity: Maximum capacity is 500 cubic feet of 1,000 BTU natural gas per hour.



ATMOSPHERIC GAS BURNERS

Applications: Designed for any gaseous fuel under high draft conditions. Particularly where it is possible to build burner directly into brickwork. For use on dryers, incinerators, industrial furnaces and kilns.

Features: Flexible firing range, turn down ratio of 20 to 1; simple control by gas firing cock and revolving air shutter; excellent flame retention with fins molded into nozzle. Low installation and maintenance costs.

Capacities: Five sizes: from 150 to 10,000 cubic ft. of 1,000 BTU gas per hour at pressures over 1 PSI and high draft (.05" to .15" water column).



BLAST TYPE GAS BURNERS

Applications: For use with manufactured or low pressure gas, with air

supplied by a blower. Ideal for dryers, industrial furnaces, test furnaces and as preheaters.

Features: Low priced, manually controlled, blast type burner. Consists of gas-air mixer, blast air valve, cast iron nozzle and indicating cock. Mixer uses air from blower to entrain gas for delivery to burner.

Capacities: Six sizes, capable of burning from 280 cubic feet of 1,000 BTU gas under 2" water column pressure to 6,400 cubic feet of 1,000 BTU gas under 4" water column pressure.



OIL BURNERS

(low pressure type)

Applications: to be used with light fuel oils and low pressure air, with blower, manually operated burners for use on dryers, heaters, industrial furnaces and roasters.

Features: Wide selection of fuel oils or distillates, from No. 1 to No. 4. Simplicity and flexibility through separate oil and air valves. Constant air volume and even burning by adjustable cone within burner body. Wide range of turndown.

Capacities: Five sizes vary from 1/2-gal. oil per hour under 10" water column, air pressure to 45-gal. oil per hour under 27" water column.



AUTO-RATIO OIL BURNERS

Applications: For use with heavy or light fuel oils with combustion air supplied by a blower. Applications: dryers, heaters, industrial furnaces, kilns, roasters.

Features: Single valve automatically proportions low pressure oil and air for range. Wide selection of fuels including heavy preheated oil. Turn down ratios of 20 to 1 on larger sizes; 10 to 1 on smaller sizes.

Capacities: Four sizes: from 1.3 gallons of oil per hour under 10 ounces air pressure, to 25 gallons of oil per hour under 48 ounces air pressure.



Denver Fire Clay Company

3033 BLAKE STREET, DENVER 17, COLORADO

Please send me further information on DFC Industrial burners:

NAME:

COMPANY:

ADDRESS:

CITY: STATE:





IF PURCHASES ARE ENDORSEMENTS...

P&H is the no. 1 choice in copper mining

**Every electric shovel bought for
the Southwest by copper companies
in the past year has been P&H**

Typical of P&H acceptance in copper mining, today you will find *three or more* P&H Electric Shovels working at each of 8 out of Arizona's 9 operating copper mines.

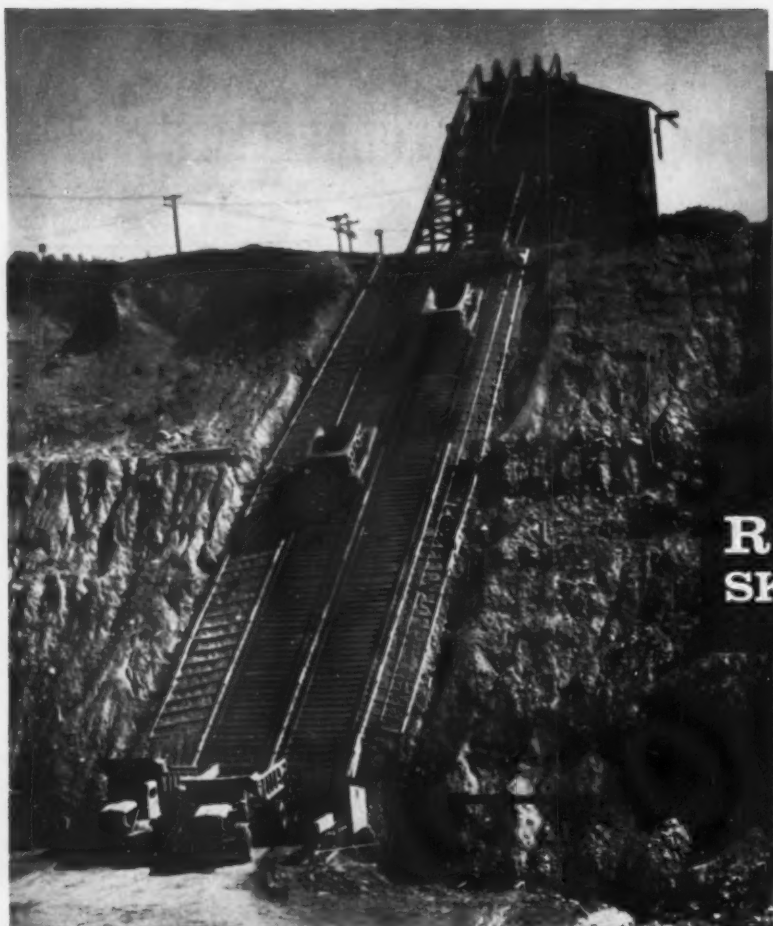
P&H has earned such widespread acceptance in the copper mining industry because of lower per-ton loading cost. This profit premium to owners of P&H Electrics results from two basic advantages.

- 1. Higher rate of production** made possible by exclusive, patented P&H design principles: MAGNETORQUE® Hoist Drive and Electronic Control.
- 2. Vastly superior service and parts availability** reflecting our partnership of responsibility to you, the buyers of our products.

Your satisfaction with these advantages has made us the *World's Largest Builder of Full-electric Shovels.*

HARNISCHFEGER P&H
Milwaukee 46, Wisconsin

Please Come See Us—AMC Show In Las Vegas—P&H Booth 503



Elevate materials
at
**LOWEST COST
PER TON**

with
**ROCKOVER
SKIP SYSTEMS**

IN USE SINCE
1949

See Us At
BOOTH 242
LAS VEGAS
Mining Show

The ROCKOVER SKIP SYSTEM has proven to be the most economical method to elevate materials from open pits. It uses the shortest and fastest hauling route, has the lowest operating and maintenance costs and requires no large investment in parts and standby equipment.

Rockover Skip Systems require no expensive wide roads for pit access and require a minimum of personnel . . . are flexible to follow pit bottom as operations go deeper . . . haul either waste or ore at anytime . . . may be loaded at any desired bench and require no sizing equipment in the pit.

NICO

SKIPS FROM 15 TO 50 TON CAPACITIES AVAILABLE

Write for illustrated brochure.

NATIONAL IRON COMPANY

50th Avenue West and Ramsey Street

Duluth 7, Minnesota

Subsidiary of Pettibone Mulliken Corporation, Chicago 51, Illinois

ASEA's new multi-rope friction mine hoists for installation in one of the largest mines take an unbalanced load of 55 tons at a speed of 2760 feet per minute—twice the load of any known hoist at this record speed.

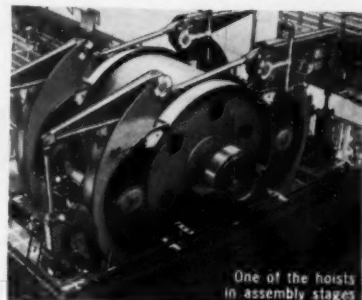
Here are two major advantages of these new mine hoists pioneered by ASEA for mine owners everywhere.

1 MULTI-ROPE FRICTION DRIVE; this enables a moderate sized pulley (length, 7'2", diameter, 12'2") to take a very high unbalanced load with ease.

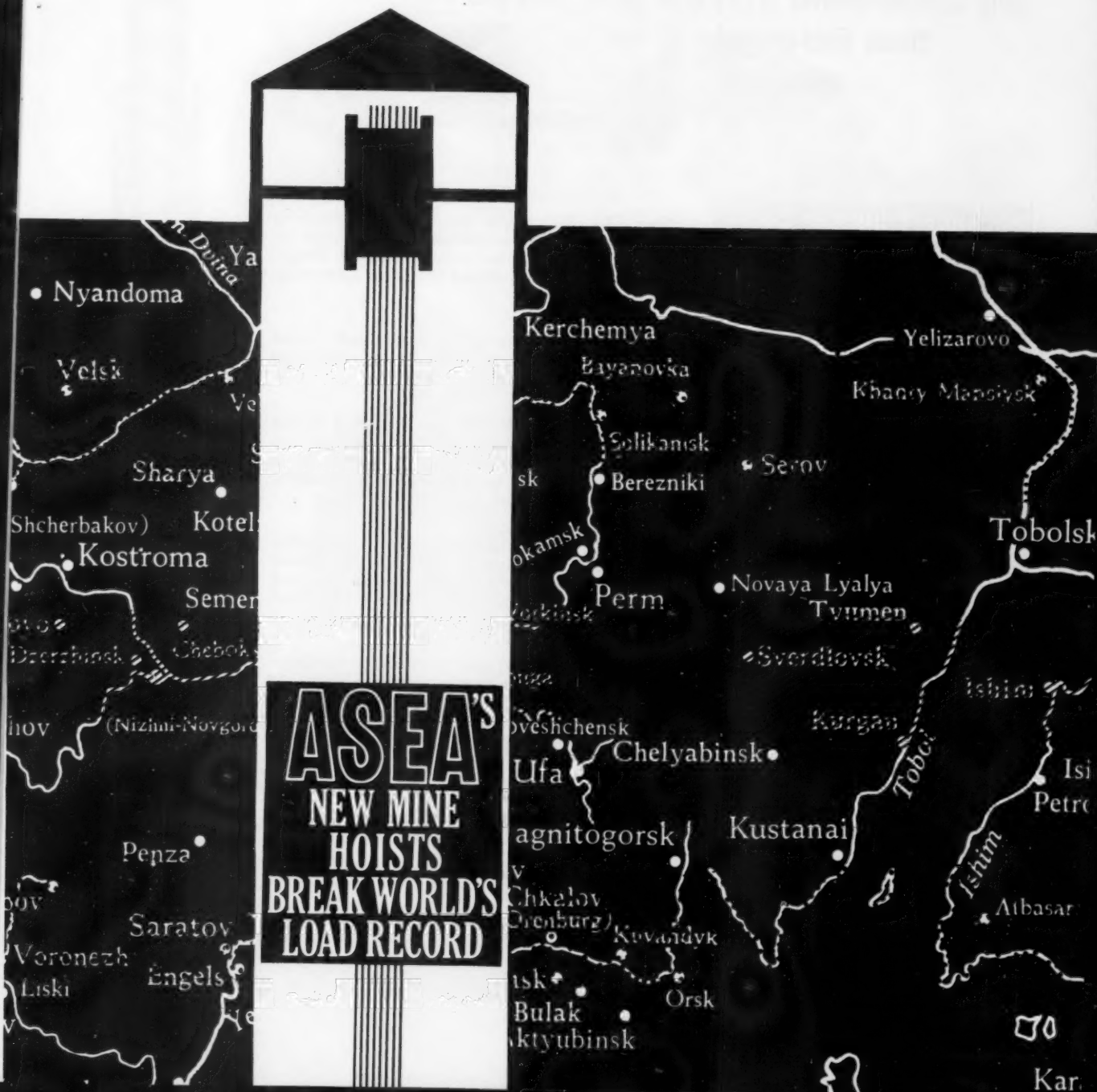
2 FULLY AUTOMATIC OPERATION, which can save as much as \$30,000 a year per hoist at prevailing U.S. wage rates, assuming two-shift operation.

Make profitable use of ASEA design and engineering experience. Let ASEA save operating costs—in a big way just as it saves for 14 U.S. and Canadian mining companies. Write for literature to: ASEA ELECTRIC INC. 500 Fifth Avenue, New York 36, New York and 55 New Montgomery Street, San Francisco 5, California.

TECHNICAL DATA	
Hoisting	Double Ship
Hoisting capacity ..	1400 tons per hour
Net load	55 tons
Ship weight	44 tons
Depth of shaft	3940 ft.
Hoisting speed	2760 ft. per min.
Number of ropes	8
Rope Diameter	1 1/4"
Diameter of Pulley	12'2"
Length of Pulley	7'2"
Motor output	17,000 h.p.



One of the hoists in assembly stages



Never before drill steel like this!

NEW GARDNER-DENVER *HI-LEED* STEEL

Drillers who have used this unique and revolutionary Gardner-Denver thread design are enthusiastic about its convenience and economy. Give it a try on your own rock drills—you'll soon see why. Call your Gardner-Denver drill steel specialist, or write for new bulletin on HI-LEED steel.

Only Gardner-Denver *HI-LEED* drill steel gives you all
these field-proved
advantages



ALWAYS UNCOUPLES
BY HAND

CUTS DRILLING TIME
ON EVERY HOLE

SENDS MORE IMPACT
TO THE BIT

DRILLS MORE FOOTAGE
PER ROD

PREVENTS LOST HOLES

New HI-LEED thread design makes wrenching unnecessary. Gardner-Denver engineers have incorporated field-proved reverse buttress design into an entirely new thread form that always uncouples by hand.

HI-LEED steel saves time in adding rod . . . and ease of uncoupling, without use of wrenches, helps drill hole faster.

HI-LEED sectional steel transmits drill impact almost as well as a solid rod. That's because precision-milled threads on rod and coupling are in close contact over a large total area, thus holding rod ends firmly together.

HI-LEED rods are designed to last longer than any other sectional steel, and the wide thread peak assures maximum wear. Carburizing and shot-peening give the steel a hard surface and tough inner core.

New HI-LEED design keeps mating parts snug—rods won't uncouple in the hole or while pulling out. Other thread forms may not hold a tight connection and many rod strings have been lost in the hole while pulling out with rotation on.

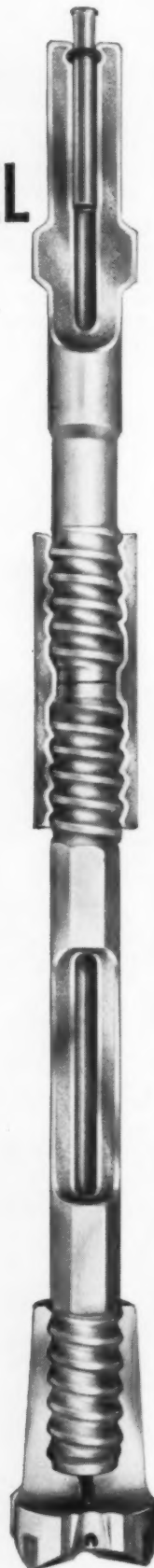


EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW
GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

International Division, 233 Broadway, New York 7, New York

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario



MINING WORLD



TALKING ABOUT
NEW CONSTRUCTION,
EXPANSION OR ALTERATION?...

TALK TO TREADWELL



Take advantage of Treadwell's broad experience and ability in engineering and designing complete plants, plant expansions, plant alterations, machinery and equipment. Many of the nation's leading industries have been using these services with repeated satisfaction. Why don't you talk to Treadwell — soon!

M. H. TREADWELL COMPANY, INC.

140 CEDAR ST. NEW YORK 6, N. Y. ■ WOrk 4-3344

SALES OFFICES:

1015 Farmers Bank Building, Pittsburgh 22, Pa.

208 South La Salle Street, Chicago 4, Illinois

SALES REPRESENTATIVES:

Shook & Fletcher Supply Company
1814 First Avenue North, Birmingham, Alabama
R. A. Ashby, 7 Live Oak Way, Kentfield, Calif.

TREADWELL

ENGINEERING
AND DESIGN
SERVICES

**COST STUDIES—PRELIMINARY
ENGINEERING — COMPLETE
ENGINEERING AND DESIGN
SERVICES FOR ■ ORE DRESSING
■ MINERALS BENEFICIATION
■ ELECTROLYTIC PLANTS ■ BULK
MATERIALS HANDLING ■ SMELTING
& REFINING ■ NON-FERROUS
FABRICATING PLANTS ■ COMPLETE
INDUSTRIAL INSTALLATIONS**

TR 41

MANUFACTURERS OF HOT METAL CARS, CINDER AND SLAG CARS, LADLE TRANSFER CARS, SMELTING & REFINING EQUIPMENT

Repower with 21000 diesel

**PERFORMANCE
PROVED**



Repowered with an Allis-Chalmers 21000 diesel, this truck now hauls more than 2,000 extra tons per week for L. J. Botcheller, Inc., Scranton, Pennsylvania.

...boost truck output 25%

L. J. Botcheller, Inc. put an Allis-Chalmers 21000 diesel into a truck used on coal silt mining at Carbondale, Pennsylvania, and boosted truck output 25 percent.

The truck body had been modified to carry a payload of 72,000 lb. Gross vehicle weight is 121,000 lb. Previously, five to seven 2-mile round trips were made per hour, with first gear used on grades. Now, with the new Allis-Chalmers 21000 diesel, the truck makes seven or eight round trips

per hour and takes grades in second gear.

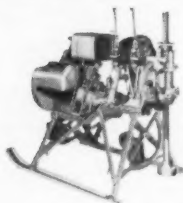
The 21000 diesel provides enough power and speed to haul an extra 50 tons an hour—and requires no additional fuel to do it! This is further proof that the 21000 has the power for tough jobs, as well as the best fuel economy in the business. See your Allis-Chalmers dealer about putting this modern diesel to work in your equipment. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS
POWER FOR A GROWING WORLD



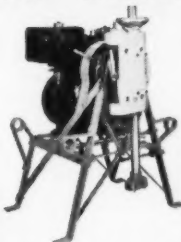
BC-33

SEE BOYLES BROS AMC EXHIBIT-BOOTH 1111



BBS-1

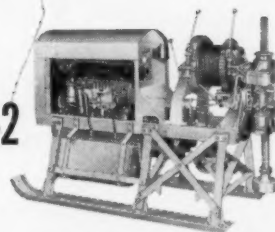
World's best known surface drill. Handles "E" Rods to 1,500 ft., "A" to 1,100 ft.



X-ray

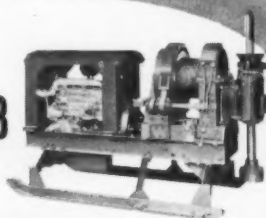
Compact, portable—185 lbs. net. Takes $\frac{3}{4}$ " or $\frac{7}{8}$ " core to 200 ft. Low fuel consumption.

BBS-2



Versatile, choice of 5 swivelheads. Depths to 3,500 ft. Gas or diesel.

BBS-3

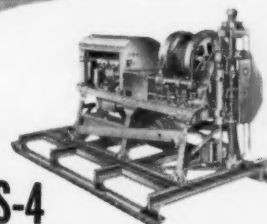


Strong, speedy unit for deep drilling . . . 4,600 ft. with "A" or "B" Rods, 95 h.p. diesel.

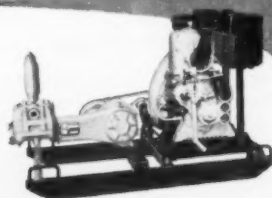
if it's for
diamond
drilling

we make it!

BBS-4



Drills to 5,000 ft. with "B" Rods. Moves under own power, gas or diesel.



drill pumps

5-12 and 4-7 models. Capacities 400 to 1,200 g.p.h. Diesel motor optional.



permaset bits

(Powdered metal)
All standard sizes available from stock. Also reaming shells, etc.



bazooka

Portable. One man sets up in stopes or raises without mining bar or sprags. Capacity 200 feet with "E" Rods.

JV

4 feed swivelhead. Capacity 800 ft. with "E" Rods. JVR with right-hand feed screw for blastholes.



BBU-2

Rugged. Capacity 1,800 ft. with "E" Rods, 1,400 ft. with "A", four gear speeds.



VEG

Vane motored version of J.V. Lightweight, compact construction. Can be speedily dismantled into two units.



BOYLES BROS
DRILLING COMPANY LTD
VANCOUVER, CANADA

58-5

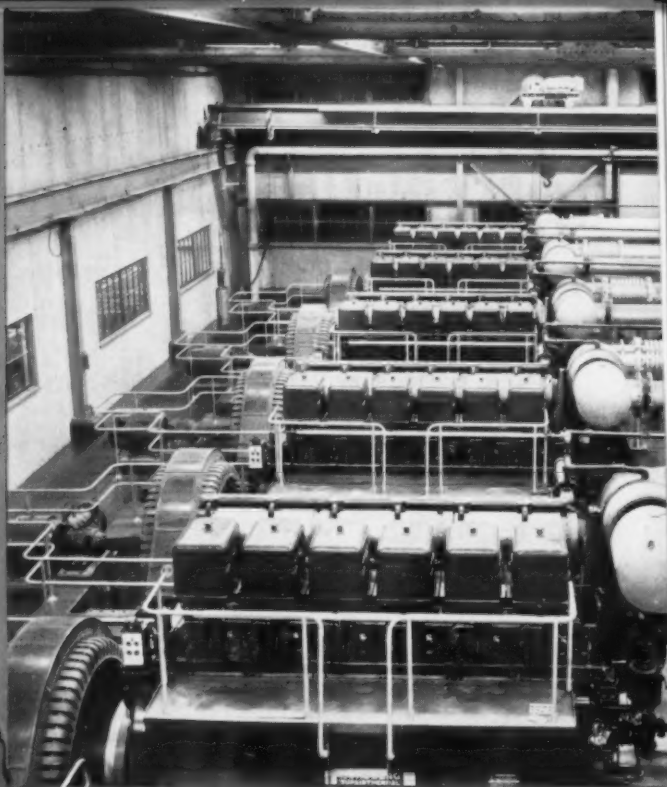
HOW NORDBERG MACHINERY SERVES THE MINING INDUSTRY

NORDBERG MFG. CO.
Milwaukee 1, Wisconsin



*SYMONS . . . A Registered Nordberg Trademark
Known Throughout the World.*

ATLANTA • CLEVELAND • DALLAS • DULUTH • HOUSTON • KANSAS CITY
MINNEAPOLIS • NEW ORLEANS • NEW YORK • ST. LOUIS • SAN FRANCISCO
TAMPA • WASHINGTON • TORONTO • VANCOUVER • JOHANNESBURG
LONDON • MEXICO, D. F.

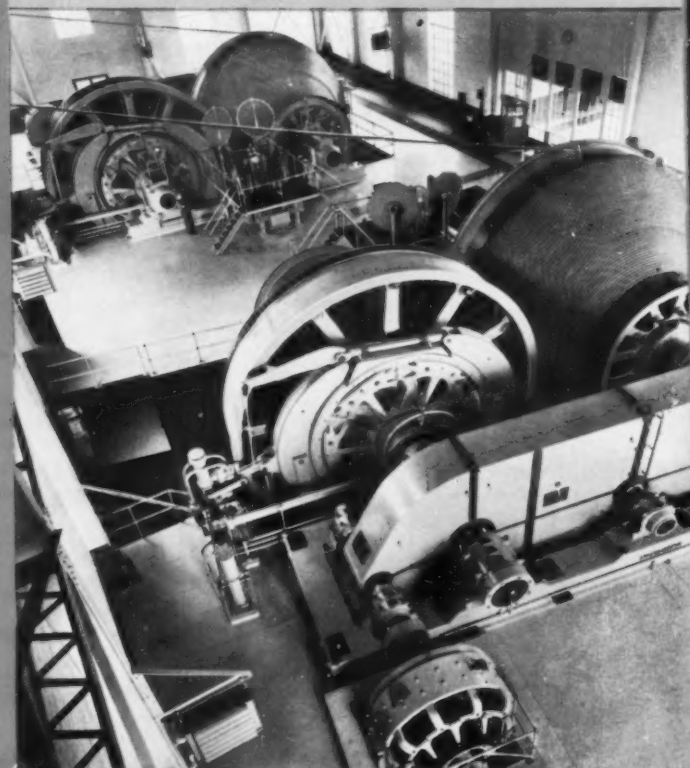


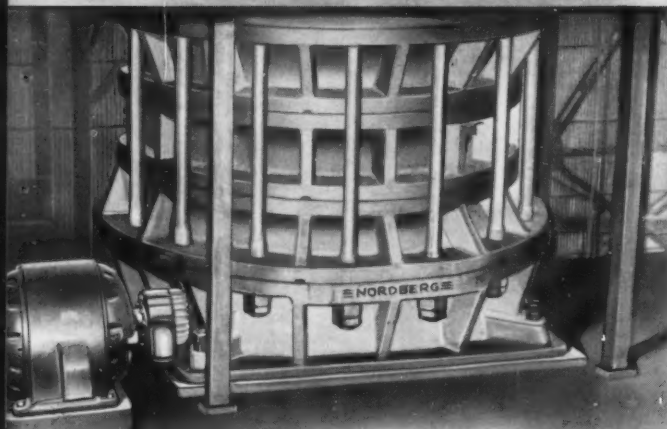
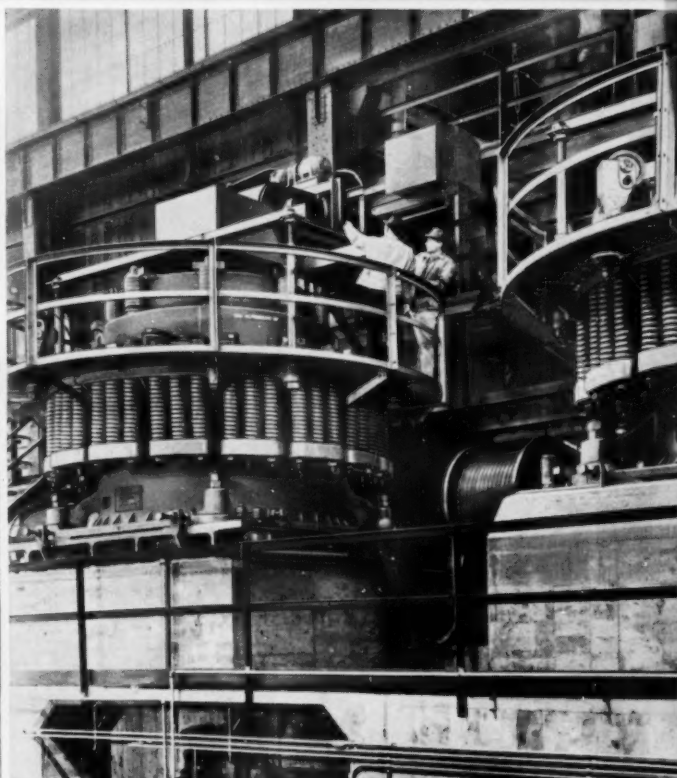
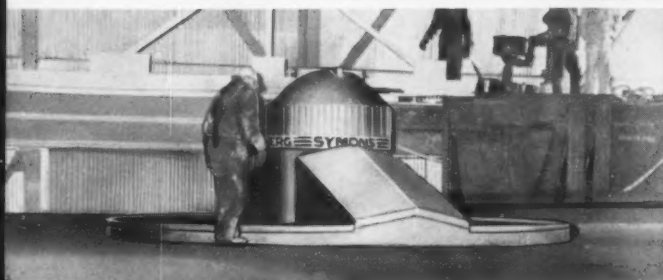
IN POWER GENERATION

Nordberg engines are built in sizes ranging from small power units to over 12,000 horsepower in a single engine . . . and are available for Diesel, Duafuel® and Spark-Ignition Gas operation.

IN HOISTING

Nordberg has an established reputation second to none, and can furnish both conventional and friction type mine hoists for men and material, to meet specific requirements.





IN PRIMARY CRUSHING

Symons® Primary Gyrotory Crushers are built for big tonnage, heavy duty primary breaking in 30", 42", 48", 54", 60" and 72" feed opening sizes. Capacities to 3500 or more tons per hour.

IN FINE REDUCTION CRUSHING

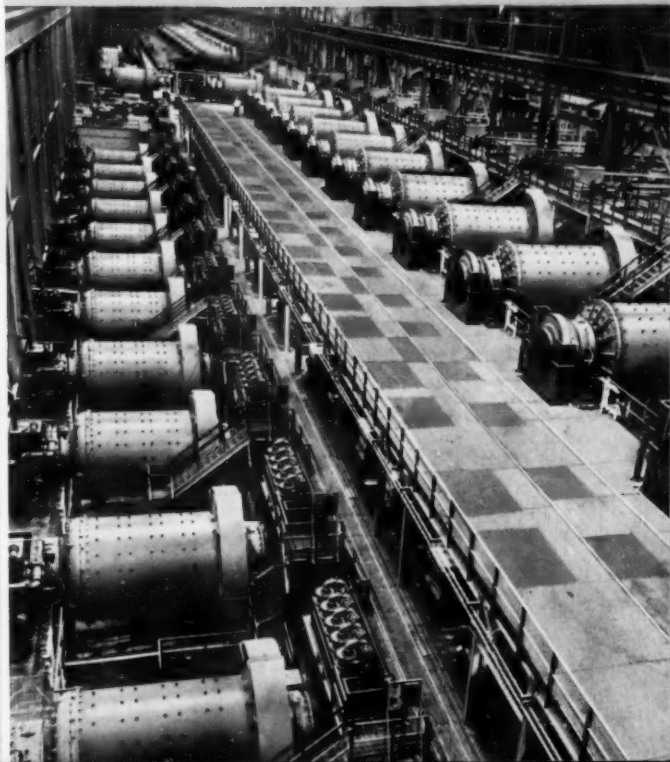
Symons Cone Crushers, the machines that revolutionized crushing practice, are built in both Standard and Short Head types, in sizes from 22" to 7' in diameter. Capacities from 6 to 900 or more tons per hour.

IN SCREENING

From scalping to fine screening, there is a Symons Screen built to do a better job at low cost. Let Nordberg experience help you select the screen best suited to your needs.

IN WET AND DRY GRINDING

Nordberg Grinding Mills include Rod, Ball, Pebble, Tube and Compartment types, in sizes from 6' to 13' in diameter and up to 50' in length.





Lima Type 1800 5-yd. shovel—one of five Limas owned by Mittry Construction, Los Angeles. Shown excavating at Abiquiu earth fill dam project, Shama River, N. Mex.

Lima Type 1800 5-yd. shovel 140-ton special crane

TYPE 1800

- Standard 5-yd. shovel with 35-ft. boom, 26-ft., 10-in. dipper handle; 7 or 8-yd. dipper for coal handling
- Converts to 112-ton crane
- Variable capacity dragline

TYPE 1800SC

- 140-ton special crane with 21-ft.-wide truck base for stability with big lifts
- Converts to variable capacity dragline

These Limas are designed to permit knock down for job to job transporation. Side assemblies come off as a unit—including belts, crawler chains and sprockets. Counterweights are removable. Backhitch-telescopic-type gantry folds down to 17-ft., 5-in. overhead clearance.

LOW MAINTENANCE REQUIREMENTS—You get more for your money when you buy a LIMA. They last longer, perform better, and require less maintenance. Lima offers you

all of these important features in a single machine—

- Air control
- Torque converter drive
- Anti-friction bearings at all important bearing points
- Large diameter clutches and brakes
- Two-shoe-type swing-propel clutches
- Combination rope-chain crowd
- Single-inside-type dipper handle, 15" square
- Extra long crane booms and special jibs available
- Convertible to crane or dragline
- 9' - 10 1/4" dia. roller path
- Six cone rollers, six hook rollers
- Standard or long, wide crawlers
- Diesel or electric power
- Knock down for highway transportation
- Independent two-drum boom hoist
- Independent propel
- Auxiliary third drum
- Power load lowering

FACTS AND FIGURES on the 1800 and 1800SC are yours for the asking. See your nearby Lima distributor today or write to Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, Ohio.

SEE OUR EXHIBIT IN BOOTH 619

AMERICAN MINING CONGRESS, LAS VEGAS, OCT. 10-13

LIMA Construction Equipment Division, Lima, Ohio
BALDWIN · LIMA · HAMILTON

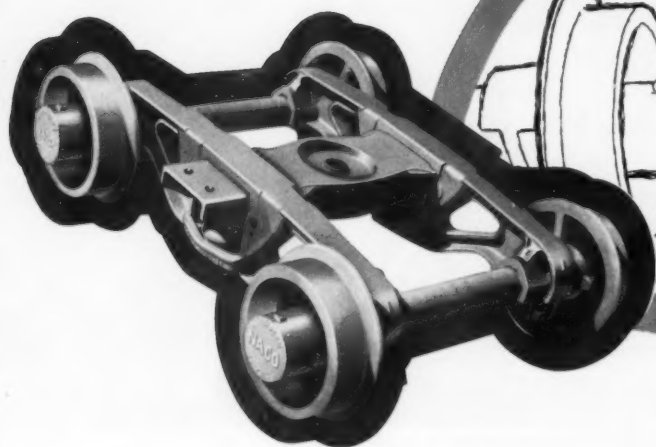
Shovels • Cranes • Draglines • Pullshovels • Roadpackers • Crushing, Screening and Washing Equipment



601

WHY LEADING MINES ORDER AND RE-ORDER

NATIONAL NC-1 TRUCKS



The reasons for the decided swing to National NC-1 Trucks are fundamentally two: they provide safety to personnel and equipment... they make money for mine operators. There are lots of technical reasons, too. Let our representatives tell you all about them.

A-1782A

Mine Sales • Transportation Products Division

WILLISON AUTOMATIC COUPLERS

•
RUBBER CUSHIONING DEVICES

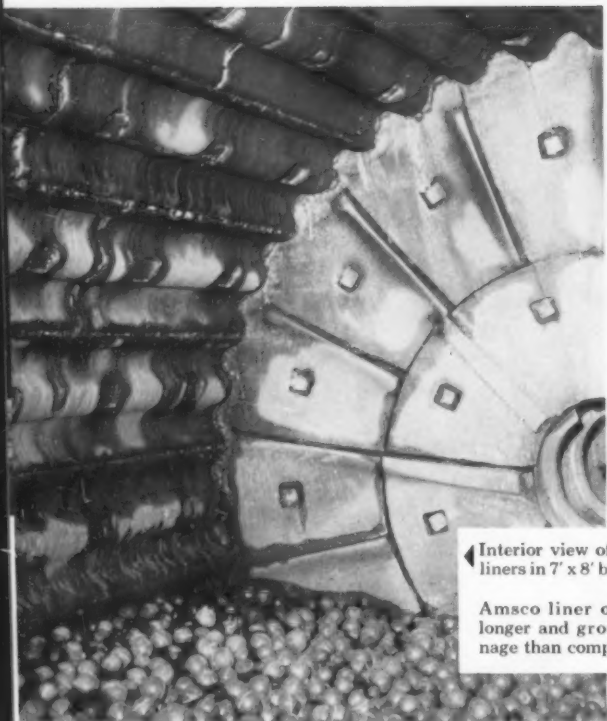
•
NACO STEEL WHEELS

•
NACO STEEL LINKS
& SWIVEL HITCHINGS

**NATIONAL
MALLEABLE AND STEEL
CASTINGS
COMPANY**

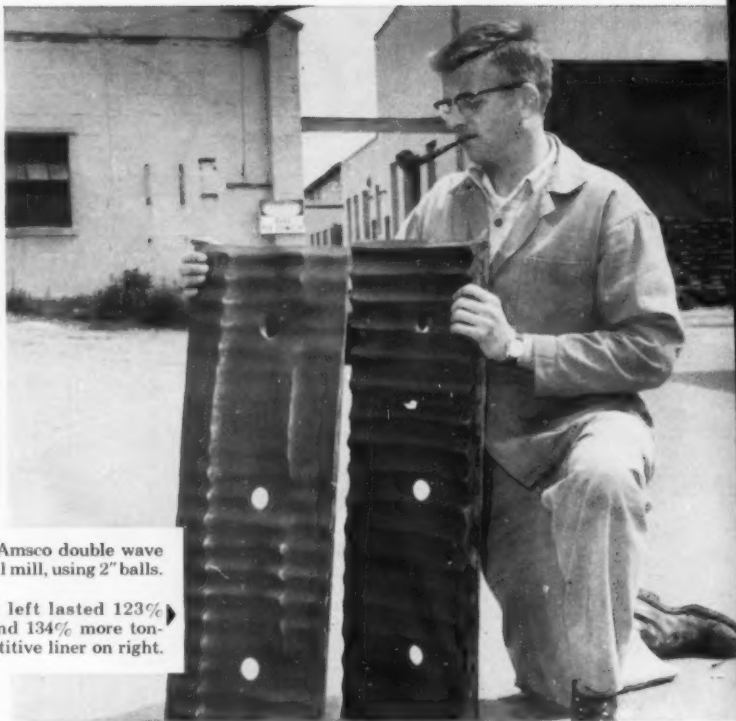
Cleveland 6, Ohio

How AMSCO helps you HANDLE



◀ Interior view of Amsco double wave liners in 7' x 8' ball mill, using 2" balls.

Amsco liner on left lasted 123% longer and ground 134% more tonnage than competitive liner on right. ▶



Bucyrus 88 D four-yard bucket, equipped with Amsco Simplex 2-part Teeth, removing rock for power station. All of Tuscarora Constructors' shovels used for rock excavation are equipped with Amsco Simplex Teeth.



MORE TONS PER DOLLAR

Read how AMSCO Mill Liners and Dipper Teeth are outlasting competitive parts in severe service



AT A LARGE
NEW YORK
ZINC MINE...


THEY'VE DOUBLED SERVICE LIFE WITH AMSCO CHROME-MOLY BALL MILL LINERS

Amsco double wave chrome-moly liners are used on an Allis-Chalmers 7' x 8' ball mill at this large northern New York zinc mine. The mill is operating 24 hours a day, six days a week... grinding rod mill discharge consisting of sphalerite,

pyrite and the balance silicate and limestone gangue.

These Amsco liners ground 670,000 tons during their 29-month life... as against an average of 286,000 tons and 13-month life for the type of liners previously used. That adds up to over 100% increase in service life. In addition to their longer life, another fact that impresses the operators about Amsco liners is that there's no circumferential grooving until the very end of their service life.

AMSCO 2-PART DIPPER TEETH ARE "BEST-WEARING TEETH WE'VE EVER USED"



AT THE NIAGARA POWER PROJECT, TUSCARORA CONSTRUCTORS ARE BUILDING THE POWER STATION AND PUMPING STATION. THEY'RE DIGGING ALMOST ENTIRELY IN ROCK, WORKING THEIR DIPPERS 24 HOURS A DAY, SIX DAYS A WEEK.

Dell Lundmark, Equipment Superintendent for Tuscarora, was responsible for selecting Amsco 2-part reversible teeth for his dippers. He'd heard of their fine performance elsewhere, and now

describes them as the "best wearing teeth we've ever used". He says the design of the teeth is very good for rock, and adds, "We're getting 15% to 20% longer wear than from competitive 2-part teeth".

Approximately 10,000 tons of rock are handled before the teeth are turned over... and tips are easy to replace when completely worn.

This combination of a new alloy steel, plus the design features engineered into the Amsco Simplex Teeth, are causing equipment superintendents everywhere to change to Amsco for better, lower cost digging.

AMERICAN

Brake Shoe

COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

Other Plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis

In Canada: Joliette Steel and Manitoba Steel Foundry Divisions



What better testimony to the long-range economy of the new Anaconda Shuttlecar

NEW ANACONDA AC SHUTTLECAR CABLE— FOR TWO YEARS AND STILL IN EXCELLENT

Two years of constant pulling, scraping, crushing, pinching and mine water hazards—and this Anaconda AC Cable is still in excellent condition.

This long, minimum-maintenance life lets you take full advantage of modern, efficient AC equipment. Such long, dependable life is also a tribute to the advanced design of this new, three-phase AC cable. For it is built *flat* with parallel conductors and grounding wires to minimize mechanical damage. The conductors are protected by special-patented

nylon breaker strips which greatly reduce the possibility of phase-to-phase shorts. The flat configuration also means increased protection from runover damage and — easy, fast reeling.

Equally important, Anaconda is first to give you this improved, advanced design built throughout with rugged, mine-proven Anaconda Neoprene. Anaconda's all-Neoprene (both insulation and jacket) construction withstands the torture conditions of mining and keeps on operating.



Cable—a two-year record of operation in the rough, tough service of the Independent Coal and Coke Mines of Carbon County, Utah.

IN ROUGH SERVICE CONDITION



Cross-section of Anaconda AC Shuttlecar Cable

Consider the advantages offered you by AC

Small, highly automatic, efficient and profitable AC mining equipment is now available. And minimum maintenance and long life of Anaconda's AC Shuttlecar Cable makes it even more economical for you to modernize with AC.

Contact your nearest Anaconda District Office or write for full details: The Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

62-1288

ASK THE MAN FROM

ANACONDA®

ABOUT THE NEW AC SHUTTLECAR CABLE

It is difficult to believe—but the truth is...

This S-D TRANSLOADER LOADED, HAULED and DUMPED 1,045 TONS in one shift!

THIS WAS NO TEST nor demonstration. This customer and user was backstopping. Several thousand tons had been shot. S-D Transloader operator Robert White was simply loading, hauling, and dumping as usual with his self-loading transport. The one way tram to dump hole was 150 feet. (S-D Transloader also operates more effectively and more efficiently than conventional equipment on long hauls.)

AT THE END OF THE SHIFT MR. WHITE HAD MOVED 1,045 TONS OF HARD ROCK! That was 190 loads! On the following night shift he loaded 180 times for 990 tons. He moved 2,035 tons in two consecutive night shifts!



Here's the stope!
Here's the Transloader!



Here's the man!

THE FACTS ARE, FURTHER, that the S-D Transloader requires (1) the *lowest* original cost for tohs handled . . . (2) *lowest* maintenance, due principally to extremely simple design . . . (3) *least* ventilation due to low horsepower to work done . . . and (4) *lowest* labor cost per ton!

The performances of many S-D Transloaders in several mines justify *your immediate* investigation! The Transloader is doing a job you cannot afford to overlook! Call us — today . . . 3-4191. Wire or write:
Sanford-Day Iron Works, Inc., Dale Avenue,
Knoxville, Tennessee, U.S.A.

WE WILL BE AT LAS VEGAS . . . with the S-D Transloader! At our Sanford-Day BOOTH 43, in addition to the Transloader, you will be able to view documentary movies showing exactly what the Transloader is doing *in action* underground to increase production at tremendous reduction in cost! We invite you to visit with us at BOOTH "43" . . . American Mining Congress, MINING SHOW, Las Vegas, Nevada, Monday-through-Thursday, October 10-13, 1960.

SANFORD-DAY
KNOXVILLE, TENNESSEE

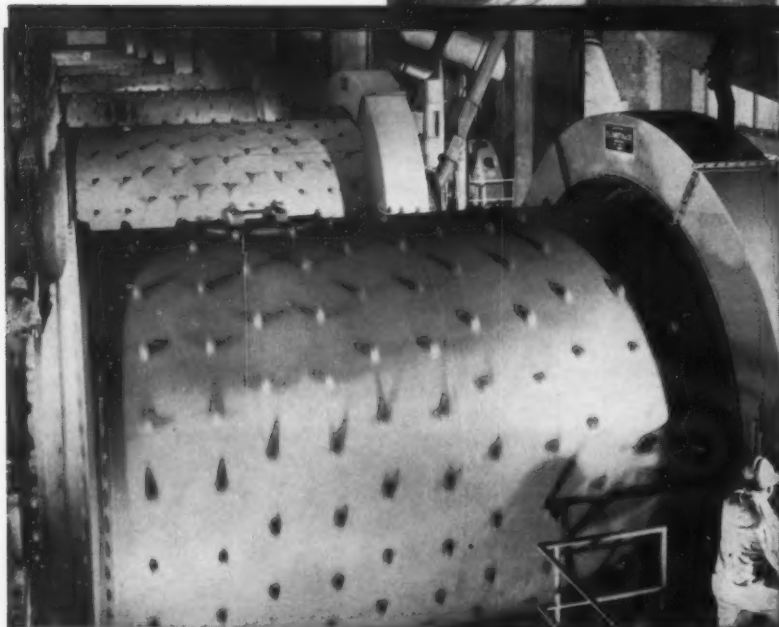


SMIDTH



rotary kilns

For sintering, nodulizing, calcining, desulphurizing, oxidizing and reducing roasting. Coolers, precoolers, preheaters, recuperators. Auxiliary equipment for Rotary Kiln Plants.



grinding mills

Ball mills, tube mills and multicompartment mills—open or closed circuit—wet or dry grinding. Also air swept for grinding and drying. Over 1250 Smidth Rotary Kilns and over 5000 Grinding Mills supplied all over the world.

F. L. Smidth & Co.

Incorporated

ROCKEFELLER CENTER

1270 Avenue of The Americas
New York 20, N. Y.

F. L. Smidth & Co., A/S
77 Vigerslev Alle
Copenhagen, Denmark

F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England

F. L. Smidth & Cie France
80 Rue Tailbout
Paris (9e) France

F. L. Smidth & Co. of Canada, Ltd.
1270 Avenue of The Americas
New York 20, N. Y.

F. L. Smidth & Co. (Bombay) Private Ltd.
42 Queen's Road
Bombay, India



OPEN PIT mine atop Nickel Mountain, near Riddle, Oregon, supplies lateritic nickel ore to smelter below. An 8,306-foot

aerial tramway delivers ore, averaging 1.5 percent nickel, to the smelter stockpile for processing.

How Ferronickel Is Produced From Low Grade Laterite by the Uginé Process

by John R. Bogert
Field Editor, Mining World

The first and only large scale nickel producing plant in the United States has been operating successfully near Riddle, Oregon, since 1954. Operated by The Hanna Nickel Smelting Company, a wholly-owned subsidiary of The Hanna Mining Company, this unique smelter produces ferronickel by the Uginé process developed and patented in France. This process involves the addition of a suitable reducing agent to a mixture of molten oxide ore in the presence of molten ferrous metal, using violent agitation for mixing the reducing agent and molten metals. This process is particularly adaptable to the oxidized nickel ores that occur near Riddle.

Since this nation has always had

to import more than 90 percent of its supply of nickel, domestic production of this highly strategic metal now reduces our dependence on outside sources by over 20,000,000 pounds a year. The success of this important enterprise is a tribute to the men who developed the reduction process, and to the engineering skills of those who planned and built the modern electrometallurgical plant at Riddle.

A low grade lateritic nickel deposit, said to be the nation's largest known reserve of nickel, is located atop Nickel Mountain two miles north of the production plant. The ore contains the nickel mineral garnierite ($H_2(Ni,Mg)SiO_4 + H_2O$), a complex magnesium silicate of nickel associated with iron, cobalt, chromium, and aluminum. After primary crushing at the mine to minus-5-inch,

the ore is transported by an aerial tramway 8,306 feet long, dropping some 2,000 feet, to a discharge terminal adjacent to the smelter. Here, a shuttle conveyor belt on an elevated trestle blends and stores it in a 140,000-ton capacity stockpile. The ore delivered to the stockpile averages 1.5 percent Ni and contains from 17 to 25 percent moisture.

Processing of the ore begins when it is reclaimed from the stockpile by a model LD8AD Scoopmobile front end loader with a 3.5 cubic yard bucket. It is delivered to any one of three 48-inch by 12-foot Universal variable speed apron feeders that discharge onto a 36-inch by 470-foot underground belt conveyor. This conveyor elevates the ore to a 200-ton surge bin above the rotary dryers.

Drying ore from 17 to 25 percent to 3 to 4 percent is accomplished by

two Standard Steel rotary dryers 10 feet in diameter and 100 feet long. They are concurrently fired and heat is supplied by burning hogged fuel, a coarse wood waste obtained from local sawmills. Should the supply of hogged fuel become inadequate, auxiliary oil burners are installed and ready for use.

Heat is generated in two H. K. Porter Dutch ovens, one for each of the dryers. Each oven consists of two fuel burning cells equipped with cast iron grates and one secondary combustion chamber. Fuel is piled on the grates by screw feeders and combustion maintained by undergrate forced draft. Hot gases are drawn through the dryers by induced draft fans. Each Dutch oven is rated at 82,500,000 British thermal units per hour at 1,900° F. exit gas temperature.

The two dryers receive the ore from the surge bin through 42-inch by 14-inch Universal apron feeders and 24-inch by 25-foot Carrier Conveyor natural frequency feeders. Dust is controlled at the dryers with two-stage Buell Cyclonic collectors and Joy Microdyne wet collectors.

The dried ore is next transported by a 24-inch by 180-foot belt conveyor to the crushing and screening plant. Here the ore is passed over a 5- by 12-foot Tyler double deck screen provided with 1½-inch top and ¾-inch bottom decks. The coarse, oversize, predominantly hard peridotite with low nickel values and high magnesia content, is rejected. Normally 15 to 18 percent of the total weight of ore is discarded having an average assay of 0.64 percent nickel. This rejected material is sampled automatically and weighed by a Fairbanks-Morse belt scale as it is sent by conveyor to a waste dump.

During the screening process occasional larger pieces of hard, high grade ore are discharged from the top deck of the screen. To prevent the loss of this ore, which is easily distinguishable by its green color, a man picks it out and returns it to the ore stream. The rejection of the hard peridotite reduces the magnesia



GENERAL VIEW of the ore preparation facilities. Drying is done in the left background, with crushing and screening handled at left center, calcining at right center.

and enriches the nickel content of the smelter feed.

All intermediate sized material from the primary screen is passed to either of two 4-foot Symons cone crushers. These are in closed circuit with a second Tyler screen provided with 1-inch top and ¾-inch bottom decks. Dust is controlled in the screening and crushing plant with Koppers Hersey-type bag filters that have maintained high collection efficiency with reasonable maintenance cost.

Calcining removes final moisture

Ore passes from the screening and crushing plant to a specially built continuous sampling plant. Here, four Denver Equipment Company Vezin-type samplers in series make successive cuts of 5 percent, 5 percent, 15 percent, and 15 percent. Two intervening Denver Equipment Company roll crushers reduce the sampled material to minus-10-mesh. Small surge hoppers with vibrating feeders installed between the samplers insure uniform and continuous feed to each sampler. The sample taken consists of 11.25 pounds for each 100.0 tons of ore delivered for processing.

After sampling, the ore is carried by a 24-inch belt conveyor to four 30-foot diameter by 60-foot high storage bins. These bins have sufficient capacity to supply the smelter for two days. Ore being dumped in the bins is blended again by an automatic traveling belt tripper, thus further insuring uniform smelter feed. A Merrick weightometer on the belt conveyor records the weight of ore delivered to the four bins.

In order to reduce the tendency of the ore to boil and splatter while being melted in the electric furnaces, it is necessary to remove the remaining free moisture as well as 60 to 70 percent of the combined moisture. This is done in two 9-foot by 250-foot variable speed F. L. Smidth rotary calcining kilns. Fuel for the kilns is No. 6 fuel oil stored in two 10,000 barrel storage tanks.

Ore for the calciners is drawn from any of the four storage bins where draw points feed ore to two drag conveyors. Each drag conveyor discharges to one of two 18-inch belt conveyors feeding the calciners. In the kilns the ore is heated to 1,200 to 1,300° F. in about one and a half hours. Fuel consumption is approximately 7.3 gallons per ton of ore calcined and kiln capacity is 45 to 50 tons of feed per hour per kiln. At the calciners, primary dust collectors are Western Precipitation Company Multiclones plus a 65,000 cubic feet a minute Cottrell electrostatic precipitator. This dust control installation reduces dust losses at the kilns to practically zero.

After being discharged from the kilns the calcined ore is transported to the roof of the smelter by two inclined automatic skip hoists. Here, at two distributing points, the calcine is dropped into four 50-ton capacity furnace feed bins located in the upper superstructure of the smelter building. These bins are directly above the four melting furnaces. Calcined ore is proportioned to the feed bins by remotely controlled, air operated flop gates. The feed bins are mounted on load cell weighing devices with remote indicators located both in the furnace control rooms

Average Analyses of Ore Handled At Stockpile

Component	Delivered from mine percent	After crushing and screening percent
Ni	1.5	1.6-1.7
Fe	8-15	10-15
MgO	25-38	24-32
SiO ₂	45-55	45-58
Al ₂ O ₃	1.0-3.0	1-3
Cr	0.8-1.2	0.8-1.2
CaO	1.0-2.0	1.0-2.0



SMELTER BUILDING contains four melting furnaces, one furnace for ferrosilicon, and two refining furnaces, all electric. Water cooling towers in foreground.

and on the kiln operating deck.

Every effort is made to conserve heat in the ore. From discharge at the kiln on through the furnace feed system skip loaders, skip cars, pipes and furnace feed bins are completely insulated. Stainless steel is used extensively where hot ore contacts bare metal.

Smelter equipment most modern

The smelter building proper, a four story structure, has 55,464 square feet of ground space. Equipment consists of seven Lectromelt electric furnaces, two Willamette Iron & Steel Company ladle handling machines known as "skip mixers," four remotely controlled turntables, eight self-propelled ladle cars, 22 reaction ladles, 12 slag ladles, two P & H and one Browning overhead cranes, a pig casting machine, and miscellaneous auxiliary equipment.

The electric furnaces, made to specifications by the Lectromelt Furnace Division of the McGraw Edison Company, are four 14,000 KVA units for melting ore, one 13,500 KVA furnace for producing ferrosilicon, and two 2,500 KVA furnaces for refining.

The three-phase melting furnaces are open top, hydraulically tilted units 26-feet 3-inches inside diameter by 10-feet deep. Covering hoods are provided for dust control and to protect operating personnel from arc glare. A 33-inch refractory bottom with a shallow corbel section is provided. The sidewall is not lined since water cooling provides the necessary protection. The electrodes are self-baking type, 40-inches in diameter, controlled by balanced beam regu-

lators and actuated by hydraulic cylinders. The furnaces are operated at 465 volts phase to phase with electrodes spaced 80 inches center to center. However, voltages of 300 to 465 are available in nine steps. To minimize reduction of metal during the melting process the furnaces are operated open arc.

A total of 360,000 cubic feet a minute of Koppers Hersey-type bag filters control dust on the melting furnaces.

The three-phase ferrosilicon furnace is open top, submerged arc, and is 22 feet inside diameter by 14 feet deep. Voltages of 105 to 166 are provided in ten steps. Two tap holes are provided for alternate use. The

electrode assemblies are the same as those on the melting furnaces.

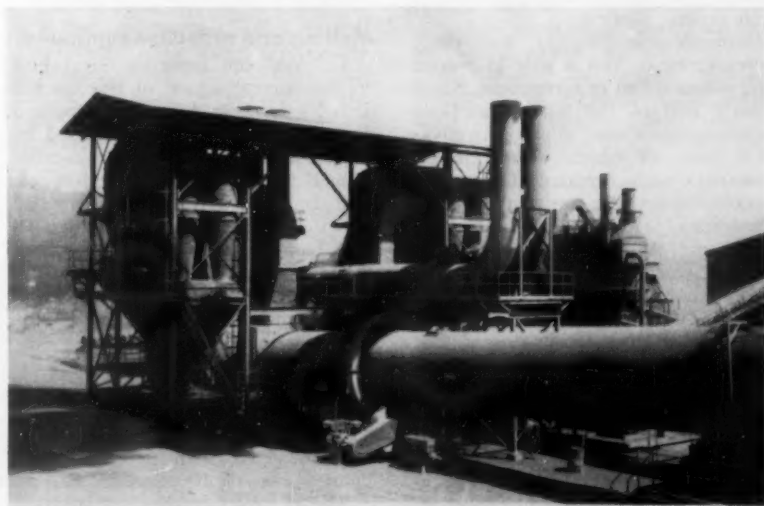
The three phase refining furnaces are closed top nine ton capacity units with 10-inch graphite electrodes. These furnaces have swinging roofs, hydraulic tilt and balanced beam regulators.

Ore reduction by Uginé process

The Uginé process, patented by Mr. René Perrin, President of the Société d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Uginé, is the method used at Riddle for the reduction of nickel and iron from the low grade lateritic ore. This process involves the addition of a suitable reducing agent to a mixture of molten oxide ore in the presence of molten ferrous metal, using violent agitation for mixing the reducing agent and molten metals. In the process, high temperatures are maintained during the reduction cycle by the exothermic heat of the reaction. The Uginé process is particularly adaptable to the nickel ore of high magnesia content that occurs atop Nickel Mountain. The process is also attractive in this northwestern part of the United States where low cost electric power makes electric furnace melting economical.

In adapting the Uginé process to local conditions, the Riddle smelter uses silicon as a reductant, added in the form of 45 percent ferrosilicon. Agitation of the reductant and molten ore is accomplished by pouring the material rapidly from ladle to ladle.

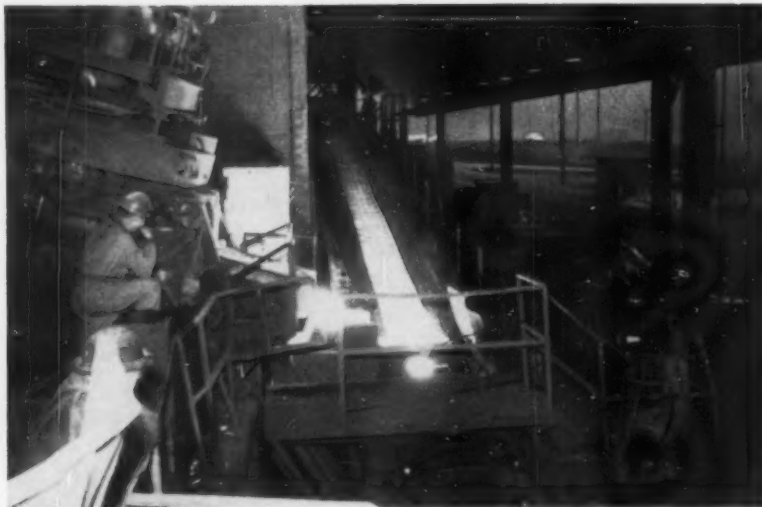
Ferrosilicon is produced in the submerged arc furnace which is charged with a mixture of silica, coke, shredded iron turnings, and hogged fuel. Charging is done with a Hough



DRYING KILN and Cottrell electrostatic dust precipitator. This is one of two rotary kilns each 100 feet long with 10-foot inside diameters.



POURING MOLTEN ore from ladle to ladle is important step in reduction.



CASTING PIGS from one of the tilting refining furnaces. Each pig weighs about 40 pounds and assays about 46 percent nickel and 52 percent iron.

front end Payloader. The molten ferrosilicon is tapped from the bottom and cast in a continuous casting machine. It is then cooled and crushed to minus- $\frac{1}{8}$ -inch preparatory to being added to the molten ore in the ladles. It has been found that coarser ferrosilicon does not melt fast enough to provide thorough mixing, and finer ferrosilicon produces excessive amounts of fine material which is lost in escaping hot gases.

The average consumption of 45 percent ferrosilicon is 1.77 pounds per pound of nickel contained in the molten ore. Approximately 44.5 percent is required for reducing trivalent iron, 30 percent for reducing nickel, and 10.5 percent for reducing divalent iron. About 15 percent of consumption is not accounted for in the above reactions due to mechanical loss of fines and oxidation of ferrosilicon during pouring.

Considerable thought and study were given to find a way to reduce the consumption of ferrosilicon. Since nearly half of the total ferrosilicon consumption is used in reducing trivalent iron, all efforts were directed toward a more economical means of accomplishing this. Early experiments determined that adding carbon or any type of reductant during the ladling reactions caused either violent carbon boils or no significant reduction is ferrosilicon requirements. However, further work showed that the addition of a carbonaceous reductant at the intake of the calcining kiln caused no adverse reactions. Tests were run using powdered coal fed to the kilns at a fixed rate. As expected, no reduction took place in the kiln because of the oxidizing atmosphere. The volatiles were removed from the coal, and some un-

burned carbon passed through with the calcined ore. This resulted in approximately 50 percent of the trivalent iron being reduced up in the melting furnaces. This reduced ferrosilicon consumption by approximately 15 percent and electrode consumption by 10 to 12 percent.

Tests were made next using locally available hogged fuel instead of coal. Again, no reduction took place in the kilns but the cost per pound of hogged fuel was considerably less than coal. Also, savings in ferrosilicon and electrode consumption was comparable, but oil consumption in the kilns was reduced about 13 percent.

As a result of the above tests, the addition of hogged fuel to the kilns has become standard practice. A permanent installation for adding this coarse sawdust has been installed.

Melting and reduction continuous

Calcined ore from the feed bins in the superstructure of the smelter is fed by gravity to the four melting furnaces. The ore feed is directed by insulated stainless steel pipes located around the periphery of the furnace. Ore flow is controlled by remotely operated visor-type gates located in the feed pipes immediately below the feed bins. Ore is fed to the furnaces practically continuously, except during the period while a furnace is being poured. Normally, the molten pool in a furnace contains between 145 and 185 tons of material.

Average power consumption per ton of molten ore produced in 1959 was 683 kwh, with electrode paste consumption of 10 pounds.

The melting furnaces are operated as two parallel producing lines. Each line contains in addition to the two

furnaces, one skip mixer, two turntables, two reaction ladles and two slag ladles mounted on self-propelled remotely controlled cars. Operating controls for all equipment are located in an air conditioned control room where operators have a clear view of the production lines.

A typical reaction cycle consists of several steps. A weighed amount of molten ore, approximately 11 tons, at a temperature of 2,940 to 3,000° Fahrenheit, is poured from a melting furnace into a 280 cubic foot refractory lined ladle. This ladle is positioned in the skip mixer while an identical ladle containing 9 to 14 tons of molten ferronickel, or "seed metal," is waiting in the other side of the mixer. The ladle containing metal is raised and carefully poured into the molten ore. At the same time that the seed metal is being poured, the correct amount of crushed ferrosilicon is added, care being used to so direct the ferrosilicon that it enters with the seed metal, thus attaining thorough mixing and agitation. Reaction of the reductant is very rapid and a considerable amount of exothermic heat is generated.

After the addition of ferrosilicon, the mixture is poured rapidly from ladle to ladle four additional times, after which it is allowed to stand for a minimum of three minutes to promote settling of the metal to the bottom of the ladle. Following this, slag is decanted from the metal and another reduction cycle is started. A complete reduction cycle requires 15 to 16 minutes.

Molten slag is granulated with high pressure water jets.

As the ferronickel, or seed metal, builds up in the system it is weighed on track scales at regular intervals.

Normally 800 to 900 pounds are produced with each reaction. When this weight has built up to 28,000 to 30,000 pounds, a portion is removed or "thieved." This is done by pouring the metal through a small overflow ladle suspended from an overhead crane. Samples of metal are taken at this time, which serve as a guide for refining as well as to control the nickel content of the seed metal.

Refining done with two furnaces

Refining consists only of dephosphorizing and deoxidizing the ferronickel to meet government specifications. These specifications are, in percent: nickel, more than 25; phosphorus, less than 0.05; sulphur, less than 0.05; carbon, less than 0.20; chromium, less than 0.25.

Normally one heat of ferronickel for refining consists of about 17,000 pounds of thieved metal with a phosphorus content varying from 0.15 to 0.40 percent. This metal is carried to one of the two refining furnaces by an overhead crane. The normal procedure for dephosphorizing consists of oxidizing the phosphorus to P_2O_5 with iron ore in the presence of a high lime slag to form $Ca_4P_2O_9$. In this form it is skimmed from the furnace.

Varying amounts of phosphorus in the metal and varying size of thieves made it necessary to establish a schedule for fluxing additions in order that time might be saved and calculations reduced to a minimum in the refining process. A schedule of flux weights has been established, based on the weight and phosphorus analysis of the heat, and additions of pebble lime and coarse iron ore are added as dictated by this schedule. The refining procedure follows closely the normal practice for phosphorus removal used in the steel industry. Care is used to thoroughly skim slags from the metal to prevent phosphorus reversion before casting.

After de-phosphorizing is completed, the metal is de-oxidized by the

addition of coarse ferrosilicon, at a rate of about 1.8 lbs. of 45% ferrosilicon per 100 pounds of ferronickel. A flash count of 45 seconds, following de-oxidation, results in an average casting temperature of 2700° Fahrenheit.

The materials and supplies used per pound of ferronickel refined are (in pounds): lime, 0.040; iron ore (60 percent Fe), 0.037; fluorspar, 0.002; dolomite for furnace patching, 0.009; ramming refractory for patching, 0.016; electrodes, 0.004; refractories for furnace lining, 0.04 cents; power consumption, 0.12 kwh.

Casting pigs is final step

A 90-foot pig casting machine, manufactured by the Pittsburgh Coal Washer Company, is mounted on tracks and can be positioned in front of either refining furnace. The ferronickel is poured directly from the hydraulically tilting refining furnace into a small combined forehearth and casting spoon, which directs the metal into the pig molds. The operator at the refining furnace can easily synchronize the speed of the casting machine to the flow of molten ferronickel to produce pigs of even size. The average pig weight is 40 pounds and during 1959 averaged, in percent: Ni, 45.94; Fe 52.38; S, 0.006; P, 0.024; C, 0.029; Cr, 0.02; Si, 0.9; Co, 0.5; Cu, 0.2.

From the casting machine the pigs fall into a water-cooled tumbler. There they are cooled and any adhered mold wash or minor metal splatters are removed. The final phase of operations consists of marking the nickel content on the pigs, based on the sample taken at the refining furnace, and palletizing for shipment.

Auxiliary facilities extensive

To overcome the erosion and severe wear on reaction ladles, special water cooled slag lining forms were developed. With these forms, a lining of slag can be poured in the ladles thus protecting the ladle refractories. Before slag lining was

used, a bare brick ladle lining would be ruined after some 40 to 60 pours. With the use of the slag lining form, brick linings have averaged 7,887 pours during 1959.

Molten ore and metal splashes on the upper sidewalls of the ladles freeze into hard skulls containing considerable ferronickel. To recover this a skull treating plant was built. This plant consists essentially of crushing, grinding, and screening the skull, with recovery of metal values by magnetic separation. Equipment consists of a 50- by 40-inch Dixie hammer mill, an 8- by 7-foot Marcy ball mill, three Dings dry-type magnetic separators, two Tyler screens, two Dings high intensity wet magnetic separators rated at 3,000 gauss, a Standard Steel concentrate dryer, and associated equipment. All ferronickel products from the skull plant are returned to the smelter reaction cycle for processing. Nickel recovered from the skull plant averages 9 to 10 percent of total smelter production.

Water for all smelter operations, over 1,000,000 gallons daily, is pumped from nearby Cow Creek. Four separate circulating systems handle 4,500 gallons a minute and every effort is made to recover water. After cooling the four melting furnaces, hot water is passed through a cooling tower where it is cooled and recirculated. Water used in granulating slag is recovered by a Western Machinery Company 78-inch spiral classifier and thickener.

Power for the smelter is supplied by a sub-station of the Bonneville Power Administration and the California-Oregon Power Company. Approximately 69,000 kilowatts are required for operations.

A 2.5 mile spur track, connecting with the main line of the Southern Pacific Railroad, has been built to the smelter. Hanna Nickel has its own Diesel locomotive and crew.

The smelter and related facilities operate on a 24-hour, 7-day week basis and employ a work force of about 360 people. END



ROTARY calcining kilns remove final moisture from the nickel ore. The two 9-foot by 250-foot kilns use fuel oil plus a quantity of hogged fuel to reduce later ferrosilicon losses.

Hanna Nickel Production Data—1959

	Dry Tons	Percent Nickel	Pounds Nickel
Total ore from stockpile	823,835	1.50	24,697,264
Hard rock rejected	142,871	0.64	1,825,847
Ore to process	680,964	1.68	22,871,417
Molten ore	604,231	1.809	21,866,252
Slag and tailing loss	—	—	1,833,661
Dust & unaccountable losses	—	—	233,662
Ferronickel produced	22,630.95	45.94	20,794,091

Recovery from ore to process—91.41 percent

Total power consumption per pound of nickel produced—26.32 kwh

SAN MANUEL cuts mining costs

To reduce underground support costs, concrete has proven to be cheaper, safer, and superior to timber and steel. Special mechanized equipment now positions pre-fabricated steel forms

Since 1956 the San Manuel Copper Corporation has been using concrete for underground support at its San Manuel mine in Arizona. The success of this practice over the years has been notable. As methods and equipment have improved, costs of block development and repair have dropped. Where monolithic concrete support was first tried on a relatively crude experimental basis in 1956, today a highly efficient method of underground concrete forming and placing has been developed.

Until recently all concrete was poured over small portable plywood panel forms that required continual repair and replacement. Now, portable steel forms that are collapsible and practically indestructible have been introduced for placing the concrete lining in drifts that normally carry track, such as haulage drifts, fringe drifts, and panel drifts. To date this type of forming has not been advanced to include drifts that do not carry track, such as block grizzly and slusher drifts. A track-mounted jumbo with hydraulic rams positions the steel forms with the help of a track-mounted gantry truck. Thus mechanization is replacing much of the tedious hand labor, and costs for underground support per ton of ore mined are lower than ever before.

The use of concrete at San Manuel for ground support has grown now to include much of their primary development work. Thus, both steel and wood forms are now being used to place concrete in grizzly level fringe drifts, haulage level panel, ladder and main drifts. This trend toward more concrete ground support is based entirely on the economic picture, namely: the minimum cost required to produce a pound of copper.

Competitive with timber and steel

After early experimenting with timber, rigid and yieldable steel supports, concrete was introduced at San Manuel in August 1956 to cope with the weak, heavy, moving ground and pressures encountered in block grizzly, slusher and panel drifts. Although development costs increased, repair and maintenance costs showed a substantial decrease. With new concrete forming and placing techniques it was soon seen that underground concrete support was economically competitive with timber and steel, and offered superior strength. In addition it provided better ventilation and fireproofing, and made for cleaner, safer, and more efficient underground working conditions.

In 1957 the efficiency of placing concrete was consider-

ably revised and improved when the Flocrete process was installed. This further reduced costs until today block development and repair costs, where concrete support is used, is less than \$0.264 per ton of ore mined. Further economies in concreting the primary development in heavy ground areas are to be expected after all the efficiencies of the new portable steel forms are realized. The preliminary figures indicate a reduction in forming labor costs of 50 percent over previous methods.

Underground concreting efficient

The new collapsible steel forms were first used at San Manuel in April 1960. They were designed by the Flocrete Manufacturing Company of Los Angeles, California and fabricated to specifications by the Consolidated Western Steel Corporation and the National Tank and Manufacturing Company. They will eventually replace wooden forms used in primary level development which includes grizzly panel and fringe drifts, haulage panel drifts, and other larger workings where heavy ground is encountered.

The new steel forms are built in five-foot sections in three styles: 8-foot 5-inch diameter circular, 11- by 8-foot horseshoe, and a horseshoe turnout form for greater drift widths. They are hinged in four places and fold into a compact unit. Installation of these forms is almost completely mechanized with a compressed air gantry crane placing the form into position while a track-mounted jumbo, with two vertical hydraulic rams, pushes and holds it into final place until it is securely bolted. Although built in five-foot sections, two bolted sections totaling 10 feet in length are usually installed at one time. Wedge-shaped "Dutchmen" of 14½-inch widths are used at curves.

Present use of the steel forms in the mine is limited to track drifts with rail haulage. However, as more mechanized methods of handling are developed they will be utilized elsewhere.

The unique system of underground concreting at the San Manuel mine is a marvel of efficiency and planning.

Bulk cement, coarse aggregate, and washed sand are delivered to a 300-ton surface batch plant located approximately one mile from the mine area. Dump trucks containing four 1½ cubic yard batch compartments then deliver cement, sand, and aggregates to surface mixers. One dual drummed, track-mounted 1½ cubic yard surface mixer is located on the fringe of the mining area. Concrete for the first mining level only is poured down one of two 12-inch

with concrete

cased churn drill holes lined with 8-inch steel alloy pipe. One of these holes is located on the north edge of the ore body and the other on the south edge. The mobile concrete mixer can be moved from one surface location to the other to meet the convenience of the underground placing crews. Concrete for the second level only is dry batched to the No. 1 shaft where a second $1\frac{1}{2}$ cubic yard mixer is located. Here the concrete is poured down one of two 8-inch standard pipe lines mounted in the shaft service compartment.

At the bottom of the churn drill holes and shaft lines, 16-inch reinforced pipe headers receive the concrete and chute it into remixers. Most of the wear and shock of the falling concrete is absorbed by these headers which have replaceable bolt-on bottoms.

In the two churn drill holes serving the first level of the mine, the eight-inch lining has several slight bends. Here wear is obtained and an occasional hole is worn through. In order to counteract this, once a week the liner pipe is rotated 90° and lowered 30 feet. This 30 feet is cut off underground at the remixer station and an additional 30 feet is welded on at the surface. To detect a worn hole before concrete fills around the outside of the casing and cements it in place, 20 gallons per minute of clean water is introduced at the surface collar of the churn drill hole. This water circulates between the casings and discharges into a funnel in the remixer station. If a hole is worn in the casing, milky water and particles of rock are immediately observed in the funnel when receiving concrete. Bitter past experience has shown that a worn liner pipe will grout itself in and rapidly deteriorate to the point that concrete cannot pass through it. When this happens the hole is lost and another must be drilled.

Compressed air used to place concrete

From the pipe header underground the concrete flows into a six-cubic-yard remixer where it is agitated by an air motor. The remixer is a 5.5-foot diameter tank, 8-feet long with the top side section cut out. A special spiral agitator built around a 4-inch tubular shaft extends the length of the tank. It is mounted on water-lubricated bearings and driven by the chain-connected 10 horsepower air motor. A continuous stream of water passes through the bearings to prevent cement from seeping in and freezing the shaft.

A separate telephone circuit and light-bell system are used for communications between remixer and surface mixer. A standardized system of bells is used for ordering, sending, and indicating receipt of concrete. This prevents pouring several batches on top of each other if a plug occurs between surface and remixer station.

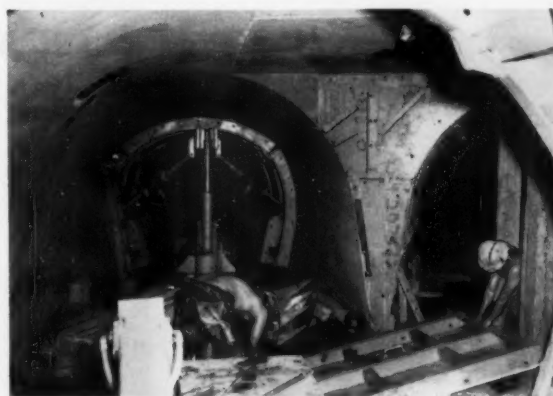
Concrete is moved from the underground remixer to the drift forms by trains of four to six portable Flocrete

Continued overleaf

GANTRY CRANE and three man crew placing steel turnout form in haulage drift.



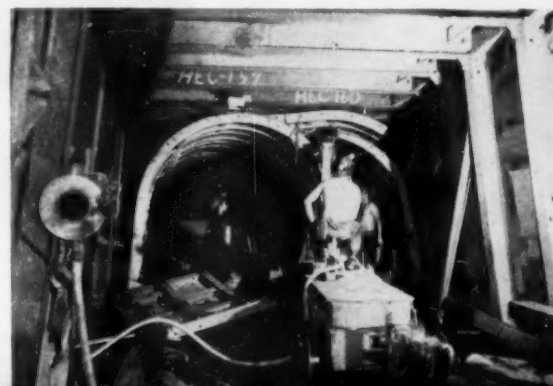
COMPLETED concrete-supported 165-foot radius turnout on haulage drift ready for traffic.

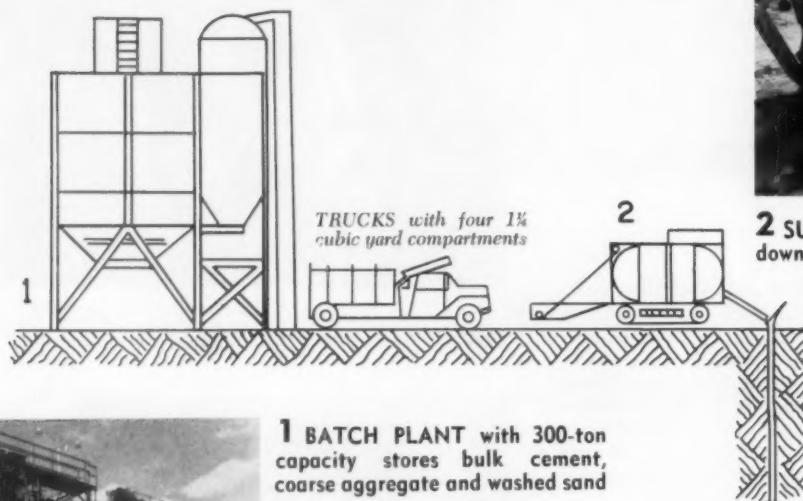


CREW removes collapsible forms after concrete has hardened. Form moving jumbo in background.



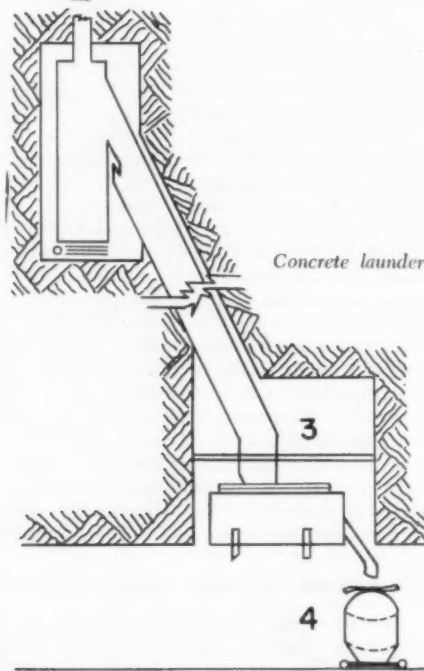
STEEL FORMS being positioned. These are the largest forms used and measure 8- by 11-feet.





2 SURFACE MIXER pours the concrete down a cased churn drill hole

1 BATCH PLANT with 300-ton capacity stores bulk cement, coarse aggregate and washed sand



3 REMIXER receives concrete. Agitator keeps in fluid state



4 PLACERS with 1.4 cubic yard capacity move concrete from re-mixer to drift forms



Concreting Flow Sheet...

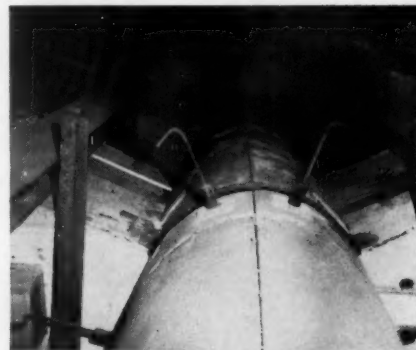
From surface batch plant to drift forms, the movement of concrete is swift and efficient



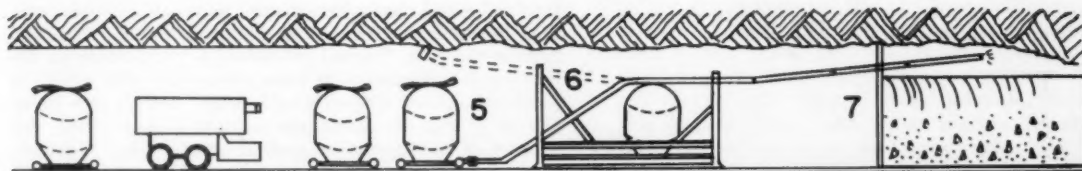
5 COMPRESSED air pushes concrete out of bottom of placer



6 DISCHARGE pipe carries concrete to portable, plywood forms



7 ATOP plywood forms in grizzly drift prior to placing concrete



THE FINAL RESULT:

Economical concrete support of superior strength providing better ventilation and fireproofing; and cleaner, safer, and more efficient underground working conditions.



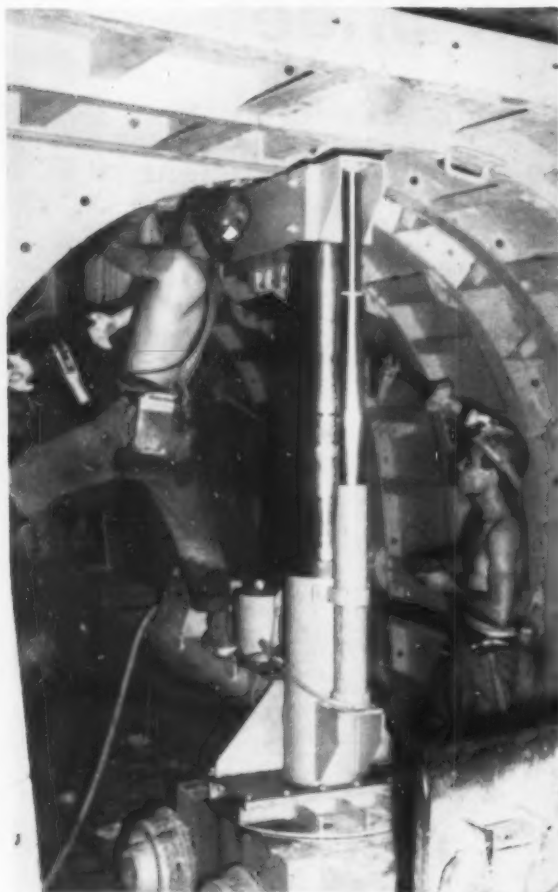
FORMS are stripped and removed within 16 hours after the pour is completed



GRIZZLY drift finished and ready for mining operations

SAN MANUEL CONCRETING

... continued from page 41

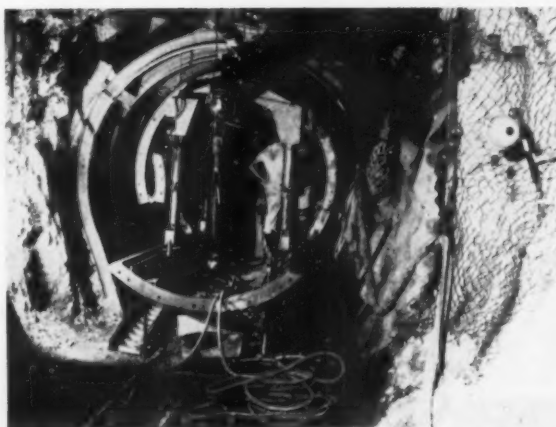


TRACKMOUNTED JUMBO using two vertical hydraulic rams holds steel form into place while it is being bolted.

placers with 1.4 cubic yard capacity. The placers are wheel-mounted, circular tanks with conical shaped bottoms, and are loaded through an opening at the top. This opening is closed by a swivel mounted rubber covered hatch which is clamped down after the pot is loaded. This gives an air-tight seal when air pressure is introduced through a turnip-shaped valve in the bottom of the placer.

A special track-mounted underpass is used in the drifts about 100 feet from the concrete forms that are to be filled. This underpass holds the six-inch discharge pipe that carries the concrete to the forms. A quick coupling attachment is mounted on the end of the pipe line for connecting to the placer. Compressed air at 90 pounds pressure is transmitted to the portable placer through the quick coupling attachment. Quick coupling hooks operated by an eccentric lever draw the placer into position and lock it for an air-tight seal between the concrete discharge pipe and the compressed air outlets. The operator quickly discharges the concrete in the placer through the pipe line and into the forms by opening the concrete check valve at the front of the placer and push the concrete through the discharge line.

A foot-operated air vibrator is mounted on the outside of the placer for vibrating down stiff concrete.



PLACING 8.5-foot circular steel form in panel drift. Hydraulic powered jumbo rides on previously positioned invert.

After each placer is emptied it is uncoupled from the discharge pipe which is then hoisted above placer height by two double-acting air cylinders. The empty placer is pushed back, and the next loaded placer brought up. The discharge header is then lowered, hooked up, and the placer emptied. Normally a train of six placers, or roughly 8.5 cubic yards of concrete, is placed in the forms in about 15 minutes.

Forms oiled to ease stripping

For the most efficient operation, two separate sections of forms are poured simultaneously. This always allows an available place to dispatch concrete trains if plugs or delays have occurred at one of the forms. Telephones and audio phones are located throughout the mine and are used for dispatching the concrete trains.

At the forms, one man works on top shifting the lightweight discharge pipe so the form will fill evenly. Hand-held air vibrators are used to consolidate the concrete on the form sides. As the form is filled and the pour retreats, sections of the discharge pipe are taken off and removed. Exceptional care is taken to see that the concrete is packed against the rock. Normal procedure is to fill a 30 to 60-foot section of panel drift form in one pour and a 52.5 to 105-foot section of grizzly or slusher drift in one pour. However, ground conditions do not always allow this amount of footage to be poured at one time. Concrete has been placed through as much as 500 feet of six-inch line with three 90° bends, and as high as 60 feet vertically without the benefit of a compressed air booster and without operational difficulties.

In virgin ground drifts are driven raw using six-foot rock bolts and wire mesh for the pre-concrete ground support. In cases where the ground will not stand with this type of support, light timber sets are used. These sets are not removed when concrete is poured. Where ground has become prematurely heavy, it is often necessary to replace the light timber with a steel set of 6-inch wide flange section. This is done only where absolutely necessary, as structural steel imbedded in the concrete has proven detrimental to concrete support of heavy, moving ground. Steel is always kept out of the concrete as much as possible.

In the smaller block grizzly and slusher drifts that contain no track and are at right angles to the tracked panel drifts, forming is accomplished by using portable, light, strong plywood panels. These forms are made from 5/8-inch plywood with two- by six-inch wooden ribs. Standard sec-



HAULAGE DRIFT forms in place ready to receive concrete. Three man crew is normally needed to position forms.



DRIFT TURNOUT to be stripped of steel forms now that concrete is set. Background turnout is completed.

tion length is 5 feet 10 inches, which is an even interval for 17-foot 6-inch draw point spacing. Forms are fabricated in company shops. Grizzly drift sections are composed of two straight side panels and two arched back panels bolted together with $\frac{3}{4}$ -by 4-inch machine bolts. A slusher drift section uses an additional 12-inch wide panel bolted between two arched back panels along the top center of the drift. In grizzly drifts the forms are set on leveling sills laid on the raw drift floor. In slusher drifts a 12-inch concrete floor with imbedded wear rails is poured between the concrete drift walls. After the forms are set, lined, and leveled, they are stull blocked to the ground and braced internally with rough 3- by 6-inch timber. The drifts are originally driven and the forming is done to allow a minimum thickness of 18 inches of concrete in the drift walls and arched roof. Finished grizzly drifts are four feet wide by six and a half feet high, and slusher drifts are five feet wide by six and a half feet high.

Before pouring concrete all forms are oiled to facilitate stripping. Tarred felt paper is stapled over any wide joints in wooden forms to prevent locking forms in place. Forms are usually stripped within 16 hours after the pour is completed.

Personnel for placing concrete on the day shift totals six in the surface crew, 13 in the underground placing crew, and 12 in the underground forming crew. The second shift has 12 men in the underground forming crew plus two pipe riggers.

Concrete mix is very important

An average of 200 cubic yards of concrete per day is now being placed on two mining levels. The maximum concrete placed in a single shift has been 250 cubic yards. A total of 350 yards has been placed in two successive eight-hour shifts.

In order to obtain the desired results in underground placed concrete without the use of excessive cement, a closely controlled mix is necessary. It must be appreciated that some of the specifications for surface construction concrete must be relaxed in order to obtain speed and efficiency for concreting underground. The job is not to build a permanent monument, but to economically support heavy ground until the ore can be extracted.

The crushed and sized (minus-1-inch) coarse aggregate and washed sand, meeting ASTM specifications, are purchased from a local contractor. Portland type II cement is delivered in bulk direct from the Arizona Portland Cement plant at Rillito. A seven-sack cement mix of 40 percent

sand and 60 percent coarse aggregate is used. Fourteen ounces of air entraining agent for better workability is added, and 21 ounces of Plastiment as a retarder and strengthener. Mixer water is cooled by a portable chilling plant which has a capacity for cooling 20 gallons per minute from 90° to 43° F. The above mix, with a water-cement ratio of 0.58 gives a 28-day compressive strength test of 3,500 pounds per square inch. The set of this mix is retarded by the use of additives so that concrete can stay a maximum time of three hours in the portable placers and still be discharged satisfactorily.

The San Manuel Copper Corporation is one of the leaders of the industry in the use of concrete underground support of heavy ground. Through their pioneering efforts the cost of large-scale placing of underground concrete has been reduced so that it is now competitive with heavy types of timber and steel support. This feat is being accomplished by the intelligent use of specialized mechanical equipment, and by the aggressive attitude of the mine staff to find the most efficient and economical method of doing a complex job.

The management of the San Manuel Copper Corporation, Mr. C. L. Pillar, mine superintendent, and his staff deserve high praise for their efforts and achievements in perfecting this unique method of underground concreting.

END

Block Development and Repair Costs Per Ton At San Manuel for Various Types of Ground Support

(Block Grizzly Drift & Draw Raise Entrances)

Timber support (4,405,985 tons mined)	
Block development	\$0.247
Block repair	0.240
Total	\$0.487 per ton
Rigid steel support (5,368,710 tons mined)	
Block development	\$0.254
Block repair	0.320
Total	\$0.574 per ton
Yieldable steel support (2,780,700 tons mined)	
Block development	\$0.285
Block repair	0.156
Total	\$0.441 per ton
Concrete support (9,851,087 tons mined)	
Block development	\$0.241
Block repair	0.023
Total	\$0.264 per ton

Africa's Key

During the period 1948 to 1958 world production of diamonds increased from 10,000,000 to 28,000,000 metric carats per year, of which an average of slightly more than 80 percent was of industrial quality. Production in 1959 is estimated at about 2,000,000 carats less than in 1958, primarily as a result of lower production from the Lubilash District of the Congo Republic.

During the same period the amounts of sales reported by the Central Selling Organization, which markets about 87 percent of the diamonds produced in the world, increased from \$107,000,000 in 1948 to \$215,000,000 in 1957, decreased somewhat in 1958, then rose to the record total of \$265,000,000 in 1959, of which an average of 30 percent represents industrial qualities.

This great increase in demand has been met by the principal producers by increase in scale of operation and improvements in efficiency of recovery by methods developed by research. During the past few years new con-



DeBeers holds commanding position from mining to final sales

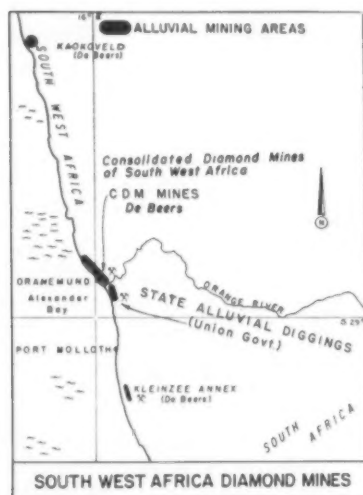
DeBeers Consolidated Mines Limited was formed in 1888 to amalgamate the holdings of the companies controlling the two famous diamond mines, DeBeers and Kimberley Central, which had been located in May and July 1871 respectively. DeBeers later purchased the Wesselton mine, discovered in 1871, and acquired controlling interest in the Bultfontein and Dutoitspan mines, discovered in 1869 and 1890 respectively, which it now operates under lease. All five of these mines are located at Kimberley within a radius of about one mile. Diamonds were found near Faresmith, Orange Free State, in 1870 but serious exploration did not begin until 1880. This exploration resulted in discovery of the Jagersfontein mine in which DeBeers subsequently acquired a con-

trolling interest and which it operates under lease. In 1902 diamonds were discovered at Cullinan, Transvaal, about 50 miles northeast of Johannesburg and in 1905 the famous "Cullinan" diamond, weighing 3,024.75 carats, was found there, the largest known in the world to date. The mine was named the Premier, and subsequently DeBeers acquired controlling interest in the company. All of the mines named above are in kimberlite pipes which were first mined from the surface by open cut methods, then by underground methods. Operations at the DeBeers and Kimberley mines were suspended in 1908 and 1914 respectively.

In 1959 operations were being conducted continuously at the Bultfontein, Wesselton, Dutoitspan, Premier

and Jagersfontein mines and also at two surface plants constructed at Kimberley within the past three years for treatment of tailing from early mining operations. In 1957 the average number of employees was 1,170 Europeans and 4,730 Africans at Kimberley and Jagersfontein, and 569 and 2,539 respectively at Premier. DeBeers also conducts a small operation at Kleinsee in Namaqualand on the west coast of Cape Province, holds interests in several small alluvial properties in South Africa, and in Kaokoveld along the coast in the northern part of South West Africa where prospecting has been under way for several years.

In addition, DeBeers controls the Consolidated Diamond Mines of South West Africa Limited, and holds a half-



Consolidated operates world's largest gem

In 1920 the assets of 10 existing German diamond mining companies in South West Africa were acquired and consolidated by The Consolidated Diamond Mines of South West Africa, Limited (CDM). The concession rights of the company comprise the tract designated as Diamond Area No. 1 which covers a strip along the coast extending northward from the mouth of the Orange River for a distance of about 320 kilometers. About 95 percent of the diamonds recovered are gem quality and the average weight is 0.86 carat, which makes this the greatest gem diamond property in the world.

The western part of South West

Africa is an arid, desolate land with no fresh water except in the Orange River which defines the southern boundary. The surface of the coastal strip is covered with loose sand in dune forms, sloping gently upward from the coast line, which supports a very sparse growth of small desert type plants. The climate is mild to cool temperate, conditioned by prevailing strong to very strong westerly winds which often blanket the land with fog formed over the cold Benguela current flowing northward at a rate of six knots. The combination of salty fog and drifting sand creates very corrosive and abrasive conditions affecting design and maintenance of

Role in Diamond Mining Part I of III

centrator plants and new recovery plants have been constructed at all of the major properties; many of them now are being operated at or near maximum capacity.

Stripping and mining trend for alluvial deposits is to mechanization where feasible. Stripping with hydraulic giants is being started at one property. Block caving proves lower in cost and is used at all but one of the underground South African mines.

Part II of this special diamond series will outline prospecting and mining.

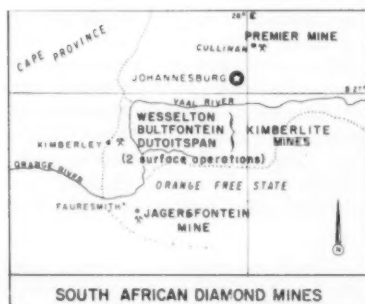
Concentrating and recovery improvements include several major methods: 1. High efficiency puddle panning for concentration of high slime crushed ore. 2. Heavy media separation for washed and screened fractions of crushed ore and alluvial gravel. 3. Conditioning of wettable diamonds to facilitate adherence to greased surfaces. 4. High tension separation of concentrate fractions.

Part III will summarize the many recovery methods at

By A. F. Daily, consulting mining engineer, 488 Fairbanks Avenue, Oakland California. He has been a consultant for various exploration and operating gold dredging companies in Alaska, Canada, New Zealand, Colombia, Brazil, and Honduras. He recently completed an extensive tour of the principal diamond mines in Africa, and directed the first technically engineered prospecting in Brazil for diamonds in a river valley gravel deposit.

all major South African plants.

Diamond recovery from principal African mines is summarized below for 1957. Attention is directed particularly to the figures in the last column, showing the average ratio of concentration achieved at the various properties. For comparison, recovery of gold worth \$1.00 (at 900 fine) from one short tone of ore represents a ratio of concentration of only 900,000 to 1.0. Obviously, efficient recovery of diamonds which have a specific gravity of only 3.5 demands careful attention to methods and procedure.



NEW CENTRAL concentrator and recovery plant at Kimberley mine was completed in June 1958. It has a rated capacity of 1,000 short tons per hour.

interest in Williamson Diamonds Limited, properties which will be considered separately. The properties controlled in South and South West Africa produce about 12 percent by weight and over 50 percent by value of world output. Thus DeBeers holds a commanding position in the industry.

DeBeers established and owns a

controlling interest in The Diamond Corporation Limited (DICORP), and a substantial interest in other companies of the Central Selling Organization which markets at wholesale level about 87 percent of the diamonds mined in the world. Through DICORP it also holds an interest in several of the major diamond mining companies owning properties outside of South

Africa proper at this time.

The Anglo American Corporation of South Africa Limited acts for DeBeers as consulting engineers and geologists and provides these technical services for all the DeBeers group of mining companies. Anglo American also has important share holdings in DeBeers, DICORP, and the diamond trading companies.

Continued overleaf

diamond mine

plant and equipment and protection of personnel.

Just north of the mouth of the Orange River the company has constructed the modern private town of Oranjemund with quarters for about 960 European employees and their 1,300 dependents. The central Diesel electric generator plant, capacity 13,500 kilowatts, administrative offices, machine shops and warehouses are located in the townsite area.

The large central concentrator and recovery plants and heavy equipment shops are situated about six kilometers north of Oranjemund. The African labor force of about 5,200 employees is quartered in two major communi-



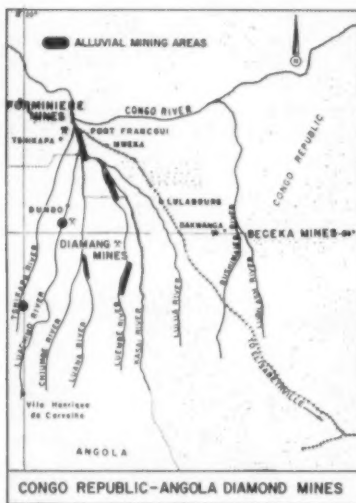
BUCKET WHEEL EXCAVATOR mounted on United States Sherman tank chassis was designed and built by Anglo American and DeBeers engineers to load beach sands.

ties north of Oranjemund and, with small groups of Europeans, in small communities further north. Concrete block or brick construction is used for most of the quarters and townsite buildings, and steel and galvanized corrugated iron for plants and shops. Fresh water is pumped to the town, concentrator, recovery plant, and principal African communities from

the Orange River (3,300,000 Imperial gallons in 1957) and is hauled to more distant points, up to 80 kilometers.

All supplies are discharged from ocean carrier at Port Nolloth on the west coast of Cape Province, South Africa, and transported northward by truck over a graded dirt road to Oranjemund, a distance of about 130 kilometers. In 1954 the company com-

pleted the Ernest Oppenheimer bridge across the Orange River, replacing the ferry formerly used. Within the concession the main roads are graded and asphalt surfaced. Rigid security regulations are enforced over the entire area of the concessions and, when leaving the area, all persons and effects are subject to check including X-ray examination.



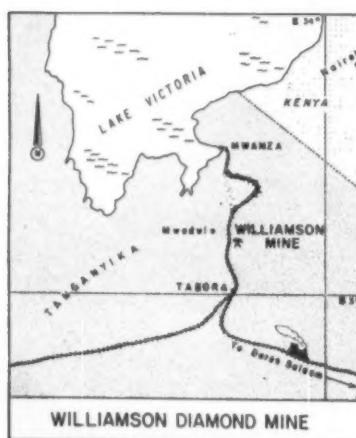
Forminiere operates 55 small alluvial mines

Société Internationale Forestière et Minière du Congo (Forminiere) in 1906 began prospecting for minerals in the then Belgian Congo and, at the Brussels office in 1909, the first diamond was recognized in a sample collected from a stream in the Tshikapa district in the south part of Kasai Province. The existence of diamondiferous deposits was proved by 1912 and a few stones were recovered and sold in that year. With United States participation mining operations were established by Forminiere and by several independent companies.

As the holdings were irregular, small, and scattered, arrangements were gradually made for consolidation

of operations in all of the properties by Forminiere which, in 1959, was operating 36 alluvial mines on its own account, 16 for the Entre-Kasai-Luebo (EKL) consortium of companies, and three for Société Minière du Beceka. The properties lie within the watersheds of the Kasai and parallel rivers in an area extending about 275 kilometers northerly from the Angola border and 40 in width.

The administrative headquarters, shops, warehouses, main hospital, and recovery plant (picking station) are situated in the modern town of Tshikapa. Many small communities with quarters for European and African personnel are maintained for the



Dr. John Williamson found a great mine

other shareholders the entire share capital of the company. A portion of the shares was paid to the government of Tanganyika in full settlement of the estate duties and taxes thereon, and an additional block of shares to make up a total of 50 percent of the share capital was sold to the government. By agreement the operation is managed by DeBeers, and Anglo American acts as consulting engineers and geologists.

At the private town of Mwadui the company has constructed attractive quarters with utilities and amenities in three separate communities.

A security fence encloses the mining claim, 4.6 square miles, and another encloses the claim and additional land comprising a total of 10.0 square miles. The administrative offices, shops, and 7,950 kilowatt Diesel generator plant are located within the townsite area and the mine, central concentrator and recovery plant are on the claim. From the Tabora-Mwanza narrow gauge railroad, which connects to the line to the port of Dar-es-Salaam, a branch line seven



RECOVERY PLANT at Williamsons, completed in 1956, treats 7,200 tons daily.

After years of prospecting, in 1940 Dr. John T. Williamson, a Canadian geologist, discovered a diamondiferous kimberlite pipe at Mwadui, Shinyanga district, Tanganyika, about 65 miles south of Lake Victoria, and located the maximum claim allowed, 4.6 square miles. Dr. Williamson formed a private company, Williamson Diamonds Limited, and proceeded with development and a gradually increasing scale of operations financed entirely out of earnings. Following his untimely death in January 1958, DeBeers purchased from his heirs and

miles in length extends eastward to Mwadui. Air service between Mwadui, Nairobi, Dar-es-Salaam, and Mwanza at the south end of Lake Victoria is provided only by company plane.

The diamondiferous deposit consists of a single kimberlite pipe with shallow fringes of alluvial deposits resting on granite bedrock. Mining by open pit methods is proceeding in the weathered kimberlite which, however, is hard enough to require drilling and blasting. At some future date the method of mining will be changed to underground.

The diamondiferous formations are elevated ancient marine terrace deposits covered with barren sand, extending from the Orange River northward for an unknown distance (in excess of 80 kilometers). Thirteen field washing and screening plants (using sea water) were in operation in 1959, producing an intermediate screen size fraction that is transported

in cars on an electric and Diesel railway line to the central concentrator.

State Alluvial Diggings (State Alluvials) is on the south side of the mouth of the Orange River, opposite Oranjemund, at the town of Alexander Bay. Here are the mine, concentrating and recovery plants of State Alluvials, owned and operated by the government of South Africa. The

diamondiferous formation and methods of operation are similar to those described above, though the scale of operation is much smaller. South African Airways provides commercial air service to Alexander Bay, but only persons authorized by the government or CDM are off-loaded here as the coastal belt is a closed area for a long distance on both sides of the rivers.

in thin layer of diamondiferous gravel in Congo Republic

mines, which are served by a network of graded dirt roads. Power from a hydroelectric plant located on the Kasai River about 17 kilometers from Tshikapa is distributed to the town and nearby communities and mines, and from Diesel generator plants and wood-fired boilers and steam generators to other camps and mines.

From Tshikapa improved dirt roads extend south into Angola, north to Port Franqui on the Congo River and east to Luluabourg, 263 kilometers, and points beyond. Most supplies are brought up the Congo River to Port Franqui, thence by truck to Tshikapa, 480 kilometers, or by meter gauge railway from Port Franqui to Mweka

station, thence by truck to Tshikapa, 330 kilometers. Scheduled commercial air service is provided by Sabena and charter service can be arranged with Air Brousse in Luluabourg.

The diamondiferous formation is an ancient alluvial gravel deposit seldom over two meters in thickness in the form of a mantle which extends over a vast stretch of country extending southward into Angola. It is covered with an eolian deposit up to 40 meters in thickness, except in the stream channels. Most of the streams have cut into the former bedrock surface and reconcentrated the diamondiferous gravel. About 20 percent of the diamonds are gem quality.

Congo Mines Now Closed

All mining halted in Kasai Province of Congo Republic early in September when National Army moved in to suppress tribal warfare between the Lulua and Baluba tribes.

Normal mining operations had been resumed on July 4th after independence celebrations were over. No damage to mines and equipment has been reported. The native labor remained orderly and faithful throughout.

Production from Bécéka for first six months of year was an all time high of 9,266,000 carats.

Beceka's 50,000 carats per day output is highest in world

Regional prospecting conducted after development in the Tshikapa area resulted in discovery of diamondiferous alluvial deposits in the valley of the Kanshi stream, a tributary of the Bushimaie River about 300 kilometers east of Tshikapa, in the Lubilash district of Kasai Province, Congo Republic. Concessions covering an extensive area were obtained by Societe Minière du Beceka (Beceka) and mining commenced about 1920. Under a contract arrangement the operations are conducted entirely by Forminiere in its name, and Beceka has had only a consulting engineer at the property for the past two years.

Kimberlite was discovered in 1947 following extensive prospecting, and further prospecting proved the existence of five closely spaced pipes. It was found that the private town of Bakwanga and plant facilities were located on top of the largest pipe so, to permit mining, entirely new communities and facilities were built. In the very modern, attractive new town of Bakwanga are quarters for the 200 European employees and their dependents, the management office and amenities, and nearby are two "garden cities" for the 7,500 Congolese employees and their 15,000 depend-

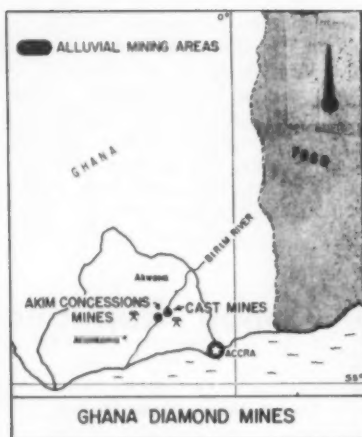
ents. The engineering and operations offices, fine warehouses and shops, and recovery plant were constructed at separate convenient locations. Operation was started in July 1959 in a new central concentrator plant constructed at a cost of £3,000,000. The company provides hospital and medical services for 100,000 native residents of the district, conducts trade and other schools, and has constructed a fine cathedral and schools that are conducted by a religious order. Power is obtained from a 10,000 kilowatt hydroelectric station on the Lubilash River.

From Bakwanga a rather poor graded dirt road to the south connects with the main road between Luluabourg and Elisabethville. Most heavy equipment and supplies are brought up the Congo River to Port Franqui, thence by meter gauge railway via Luluabourg to Tshambulub station and 110 kilometers by truck to Bakwanga. The consumption of liquid fuels transported over this route is about 500,000 liters per month. Supplies from South Africa are brought in by rail to Tshambulub. Scheduled commercial air service is provided by Sabena and charter service can be arranged.

The alluvial diamondiferous de-

posits in which mining has been conducted are located in the Kanshi stream valley near Bakwanga, and others have been proved in an area to the southeast along the Bushimaie River. It has now been determined that the alluvial deposits are primary and that the sources of the diamonds are the group of kimberlite pipes near Bakwanga and another group in the southeast area. Open pit mining has been conducted in the weathered zone of one of the pipes near Bakwanga and was started in 1959 in the top of the largest pipe of that group. Eight field washing and concentrating plants for treatment of alluvial material and one for kimberlite were operated during 1959 comprising a total of 16 2-pan units. Operations were started in the new central concentrator in July 1959 for treatment of mixed gravel and kimberlite. Production from the Bakwanga property is by far the largest in the world, accounting for about 55 percent by weight, more than 50,000 carats per working day, but the value is only about 12 percent of world sales as an average of 97 percent are industrials and over 90 percent are crushing bort, the lowest valued grade of diamond.

Continued overleaf



MECHANIZED MINING at CAST's No. 10 mine. Gravel is dug and loaded by Ruston-Bucyrus drag line into Foden truck. Note plank track on top of soft ground.

CAST recovers small diamonds—30 per carat—from gravel beds

In February 1919 the director of the Geological Survey, Gold Coast (now Ghana), and a colleague found diamonds in stream gravel near Abomose on the Birim River and within a short time 620 diamonds were found within a few miles upstream. Prospecting by several companies during the ensuing few years showed that diamonds were widely distributed in the stream gravels of the upper Birim watershed. Consolidated African Selection Trust Limited (CAST) was formed in 1924 and acquired extensive concessions in the district and exploration rights in the country. In 1959 the area of concessions held by the company was 68 square miles. Rights in adjoining properties are held by the

company Akim Concessions Limited in which CAST owns a 35 percent share interest, and for which it acts as technical adviser.

The administrative offices, shops, recovery plant, hospital and quarters for about 80 European employees and 44 dependents are located in a security fenced area at Akwatia, 65 miles by paved road northwest from Accra. Towns and villages in which the African employees and others reside are scattered along much of the concession boundaries so that security is a major problem. Electric power is provided by the 10,000 horsepower Anincheche Diesel generator station and several smaller plants. The climate is hot and humid throughout the

year. The low hills and narrow valley floors are covered with dense tropical jungle growth.

The diamonds occur in gravel beds seldom over 10 feet in thickness, usually covered with relatively thin overburden, in the valley floors and on the hillside slopes. The proximate source of the diamonds is several steeply dipping beds of Precambrian graywacke from which they have been freed by erosional processes. The operations are fully mechanized and nine field washing and concentrating plants were operated during 1959. The average size of diamonds is small, about 30 per carat, and only about 15 percent are of gem quality.



In January 1930 two geologists from the Gold Coast Geological Survey, who had been assigned to investigate the mineral resources of Sierra Leone, found two diamonds in the gravel of the Gbobra River about

SLST recovers large alluvial gem diamonds

140 miles east of Freetown. Subsequent prospecting by CAST proved very large deposits of diamondiferous gravel in two districts about 50 miles apart in the eastern part of the country. Extensive concessions in both districts were obtained by Sierra Leone Selection Trust Limited (SLST), a wholly owned subsidiary of CAST.

In 1954 the government commenced issuing "digging licenses" to Africans, valid in designated places that were intended to be outside the concession boundaries, but an influx of African diggers of invasion proportions illegally entered on concession lands, creating a chaotic condition with which the government was unable to cope. In February 1955 the company agreed, for token compensation, to a substantial reduction in the area of its concessions to a total

of 309 square miles, but illegal digging has continued. Practically all of the diamonds found by the Africans were being clandestinely exported so, in an effort to control the situation, by arrangement with the government, DICORP established a subsidiary company, The Diamond Corporation of Sierra Leone Limited, as the official purchasing agency in the country which, in 1959, was succeeded by a Government Purchasing Office managed by DICORP Sierra Leone. This procedure together with others is gradually reducing the volume of illegal exports. Mining by the African diggers, both legal and illegal, is very inefficient and reduces the diamond content to such an extent that efficient mechanized mining cannot thereafter be conducted profitably in many places. Thus the country has sus-

tained a major loss of mineral wealth and of income that is important to the national economy.

To date mining has been confined to

alluvial deposits, but kimberlite pipes have been found during recent years. The average size of the diamonds is relatively large and about 68 percent

are gem quality. The company operated several field washing and concentrating plants during 1959 and a recovery plant for each of the areas.

Diamang holds exclusive prospecting rights in Angola

Exploration and prospecting conducted after discovery of diamonds in the Tshikapa district in what then was the Belgian Congo soon resulted in discovery of similar deposits to the south in the Province of Angola. Companhia Diamantes de Angola (Diamang) was formed in Portugal in 1917 with Portuguese and United States capital and acquired exclusive rights until 1971 to prospect for diamonds in an area of about 390,000 square miles in the Province, and the perpetual right to mine all deposits marked out to that date. To date the mining operations have been conducted in the Lunda district in the northeast corner of the country, which has been declared a restricted area, and extensive prospecting in other parts of the country has failed to discover deposits of commercial tenor. The elevation at Dundo is about 740 meters and the climate is pleasantly warm with cool nights.

The administrative headquarters are in the private town of Dundo, situated on a left limit terrace of the Luachimo River about 10 kilometers by road from the Congo border. Here the company has constructed for the 440 European employees and their dependents a beautiful community

with attractive residences and landscaped grounds, clubs, stores, cinema, a large hospital, schools, churches, warehouses and small shops and one of the finest museums in Africa devoted to the culture of the indigenous peoples. The large and modern mechanical and equipment shops and the central recovery plant are situated in the town of Andrada, about 85 kilometers by road southeast of Dundo. Adequate quarters for African employees and their dependents are provided in these communities and for both Europeans and Africans at many small communities convenient to the mines. The total number of African employees is over 20,000 and medical and hospital service is provided without charge for about 70,000 natives of the district. A 12,000 kilowatt hydroelectric generating station completed near Dundo in 1957 provides power which is delivered to the field plants over a distribution system that is rapidly being attended. The company operates several large cattle ranches, a dairy, orchards and farms.

Equipment and supplies from overseas including liquid fuel for mobile powered equipment usually are delivered by the ocean carrier at the Atlantic port of Lobito, transported

by meter gauge railway to Vila Luso in central Angola, thence by contract truck 600 kilometers northward to Dundo. Items from South Africa usually are transported by rail to Luluabourg, thence south by truck 400 kilometers to Dundo via Tshikapa. There is only one through highway, to Luluabourg and points north, and Henrique de Carvalho and other points in Angola to the south. The company has constructed and maintains 1,100 kilometers of access roads to the mines. From the capital city and port of Luanda scheduled air service is provided by a subsidiary of Transportes Aereos Portugueses to Portugal, 4 kilometers north of Dundo, available only to persons holding security clearance permits.

The diamondiferous alluvial deposits are similar to and extend southward from those in the Tshikapa district of the Congo. In 1957 Diamang was operating 46 field washing and concentrating plants at 38 sites within an area about 75 kilometers from east to west and 145 from north to south, and a separate operation, called MD-1, consisting of three mines with a central concentrating and recovery plant. About 60 percent of the diamonds are of gem quality. **END**

Diamond Production by Principal African Mines for Year 1957

Country Company-Mine	Diamonds, Metric Carats	Volume Mined Units	Volume Unit	Average recovery Carats Per Unit	Average Ratio Concentration
Belgian Congo					
Beeka-Lubilash	15,016,000	5,358,000	Cubic Meters	2.80	3,200,000 to 1.0
Forminiere-Kasai	563,000	1,125,000	Cubic Meters	0.5	17,800,000 to 1.0
South Africa					
DeBeers-Dutoitspan	213,000	1,677,000	Short Tons	0.127	35,700,000 to 1.0
Bultfontein	147,000	556,000	Short Tons	0.265	17,100,000 to 1.0
Wesseltan	223,000	1,065,000	Short Tons	0.209	21,700,000 to 1.0
Jagersfontein	105,000	1,436,000	Short Tons	0.073	62,200,000 to 1.0
Premier	1,399,000	4,273,000	Short Tons	0.327	13,900,000 to 1.0
Mallin	101,000	70,000	Short Tons	1.43	3,200,000 to 1.0
State Alluvial	160,000 ¹	not published		—	—
South West Africa					
CDM-overburden gravel	—	8,734,000	Cubic Meters	—	—
	980,000	3,312,000	Cubic Meters	0.296	31,000,000 to 1.0
Ghana					
CAST-overburden gravel	—	?	—	—	—
	1,152,000	700,000 ¹	Cubic Yards	1.64	4,100,000 to 1.0
Angola					
Diamang-overburden gravel	—	8,387,000	Cubic Meters	—	—
	864,000	2,096,000	Cubic Meters	0.413	21,600,000 to 1.0
Tanganyika					
Williamson	372,000	1,219,000	Short Tons	0.305	14,900,000 to 1.0

1. Estimated.

Basis of calculation: for 1.0 metric carat = 0.200 gram

1.0 carat per metric ton = ratio of 1.0 to 5,000,000

1.0 carat per cubic meter (specific gravity 1.78) = 1.0 to 8,900,000

1.0 carat per short ton = 1.0 to 4,540,000

1.0 carat per cubic yard (@ 3,000 pounds) = 1.0 to 6,800,000



PHILEX'S big copper pit in background with waste dump in foreground. Picture shows just how rough and steep are the mountains 20 miles south of Baguio, Mountain Province.



TOURNAPULL LOADS waste in bottom of pit. Caterpillar dozers is used for pusher. Rock breaks fine along main joints.

Philex Open Pit

High in mountains, near Baguio, where it rains over 100 inches per year.

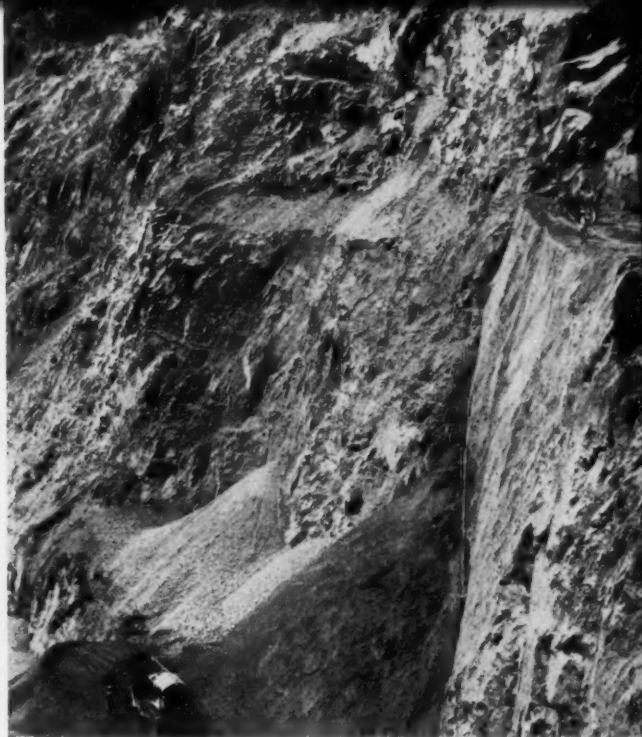
Copper-gold ore in highly shattered andesite and blocky diorite is mined from a series of high benches. Ore breaks along fracture planes to small size for easy handling.

Ore is loaded with Diesel shovels and trucked to pit entrance where it is dumped into ore pass raises extending to main haulage adit.

Stripped waste is dumped into two canyons on opposite side of ridge formed by ore body.



HORIZONTAL holes drilled on each bench with Gardner Denver leyners break ore from mountain in 50 to 100 foot lifts.



MAJOR fracture plane forms ore face. Ore breaks into small chunks along this and other fractures to lower mining cost.

Cut From Steep Philippine Canyon

Seeing is believing, but it's hard to believe even after you have seen it. That's the open pit copper-gold mine of Philex Mining Corporation. Take a close look at the pictures accompanying this article so that you can visualize the rough mountains, the steep slopes, and the limited waste disposal areas that make mining so tough. Don't let the extensive vegetation fool you into thinking that these are gentle rolling pine covered hills. Pine covered they are, it's true, but in the tropics vegetation of all kinds continually sprouts and thrives from every patch of soil.

When it rains here it really rains;

it's the usual thing for several typhoons a year to dump up to 10 inches of water into the pit in 24 hours. This water makes it mandatory to maintain good haul roads and adequate drainage. Fortunately these typhoons do some good too. The fast run off on the steep slopes settles the waste dumps and often washes hundreds of thousands of cubic yards of stripping further down the mountain side to make room for additional waste.

When Philex started its flotation mill on June 24, 1958, extensive underground development for block cave mining was behind schedule so the

open pit was called on to furnish 600 tons of ore per day. Mill capacity was rapidly increased to the point where 1,500 tons per day were mined from the pit just prior to major production from the first caving block. By May 1st of this year, 80 percent—800,000 tons—of ore milled had come from the pit.

The pit yielded fast ore, not necessarily cheap ore, as the average mining cost in 1958 was 3.54 Pesos per ton. Stripping cost was 1.73 Pesos per ton for the 620,935 cubic bank meters mined. Mining cost per ton was 0.83 Peso for first block caved.

By United States standards the pit



GENERAL MANAGER George S. Scholey had vision to see that Santo Tomas II would make a big mine. He made it come true too with the Island's newest mine.



RESIDENT MANAGER Ralph J. Seideman makes close check of open pit mining every day to maintain close grade control so that mill has uniform feed.



MINING CONSULTANT George A. Scholey laid out the open pit mine, set stripping ratios, and picked out dump areas. He also made underground plans.



FROM TOP DOWN this is the Philex pit with waste dump filling valley. Man on waste bench in foreground gives scale.



CATERPILLAR D8 pushes waste off intermediate bench while two shovels load finely broken ore into trucks on pit floor.

has a small area, walls are high and steep, benches are high, and equipment sizes are small. Problems of access to the pit area and the location of the ore body in the bottom of a steep gorge made it economically impossible to develop a pit with large area. Steep walls and high benches make lower cost mining at a sacrifice in grade control as it has been difficult to get enough stripping done to fully develop a series of benches. Large sized new equipment was difficult to purchase and import.

Fortunately the waste capping on the southeast end of the ore body can be stripped and bulldozed into a steep canyon to the east. All waste from the main pit area has to be hauled through or around the pit to waste dumps in the same canyon as the pit.

All ore is blasted or bulldozed down

to main pit floor where it is loaded into trucks with 1.5 yard Diesel shovels, hauled to and dumped into ore passes leading to the main adit. The bottom of the pit is 300 feet higher than the mill bin and 5,000 feet away, so it has been more economical to centralize open pit and underground ore haulage through the adit than to build, maintain, and truck over surface roads to mill.

The most important feature about the Philex ore body—and it is so important that it makes Philex a mine instead of a low grade mineralized mass—is the multiplicity of fracture planes, slips, joints, and veinlets. There is no secondary blasting. Only very rarely are there ore chunks over two cubic feet in size. All that is necessary is to break the ore loose from the mountain and the tumbling and drop-

ping action to the bench or pit floor breaks it into thousands of small chunks along fracture planes. A series of relatively flat holes in a face of ore will break a 50 foot high bench.

This means fast shovel loading, fast and easy handling through the ore pass haulage system, and a minimum of coarse crushing for the ore. For the waste it means that Tournapulls and scrapers can load with minimum trouble on the waste benches and pit floor.

The pit will be a big factor at Philex for the next year until additional blocks are caved. It's hard to believe that this pit could have been developed in the bottom of a steep gorge high in the Philippine mountains. The fact that it was developed so successfully is a fine tribute to the Philex staff.

END



WASTE BENCHES at left cap ore. Waste from upper benches is hauled to hidden valley behind ridge on the far left side of pit.



PIT FLOOR from upper bench. Two trucks dump waste on top of caved block. Cave has drawn overburden off mountain slope.

Five Companies Continue Major Exploration For Sulphide Ores in Southeast Missouri

Land optioning and leasing, geological and geophysical surveying, and surface drilling continue at a fast pace in southeastern Missouri according to current reports from the area. Over 450 tracts of land have been leased in the area with activity centering in Shannon, Iron, and Washington counties. General geology of the area was outlined in MINING WORLD, August 1960, page 22, by William C. Hayes, assistant Missouri state geologist.

In the Viburnum district galena in the Bonnetterre formation occurs in proximity to buried Precambrian knobs and ridges. Surface exposures include formations from the Gasconade to the Davis which immediately overlies the Bonnetterre. Depth of exploratory drilling for lead is limited by the top of the Precambrian granites and felsites which may be buried by as much as 1,200 feet of cherty dolomite and some limestone, sandstone, and shale.

Key numbers have been added to Mr. Hayes' map to show areas in which major mining companies are active.

No. 1 is the Viburnum area of St. Joseph Lead Company where the new lead mine is now in operation. No. 3 shows St. Joe's interest four miles east of Bunker near the Upper Bee Fork school and in the southwest corner of Reynolds County. More than 150 properties have been optioned and several of them purchased.

No. 2 is the Boss-Bixby area, where American Zinc, Lead and Smelting Company has been drilling for iron. The company also has at least three areas under lease near the Imoden Fork of the Black River.

No. 4 shows the area in which American Smelting and Refining Company is active five miles east of Bunker between the Lower and Upper Bee Fork schools. Eleven leases were acquired there in March and April.

No. 5 is the area northeast of Current River where Bear Creek Mining Company (Kennecott Copper) has been exploring since March 1959. As many as 16 drills have operated at one time in the area. Bear Creek's holdings are large and comprise at least 65 separate parcels. Industry sources indicate that Bear Creek has found extensive lead mineralization by this drilling. While some of this appears thin for large-scale mechanized mining, it is quite probable that an important ore body has been devel-

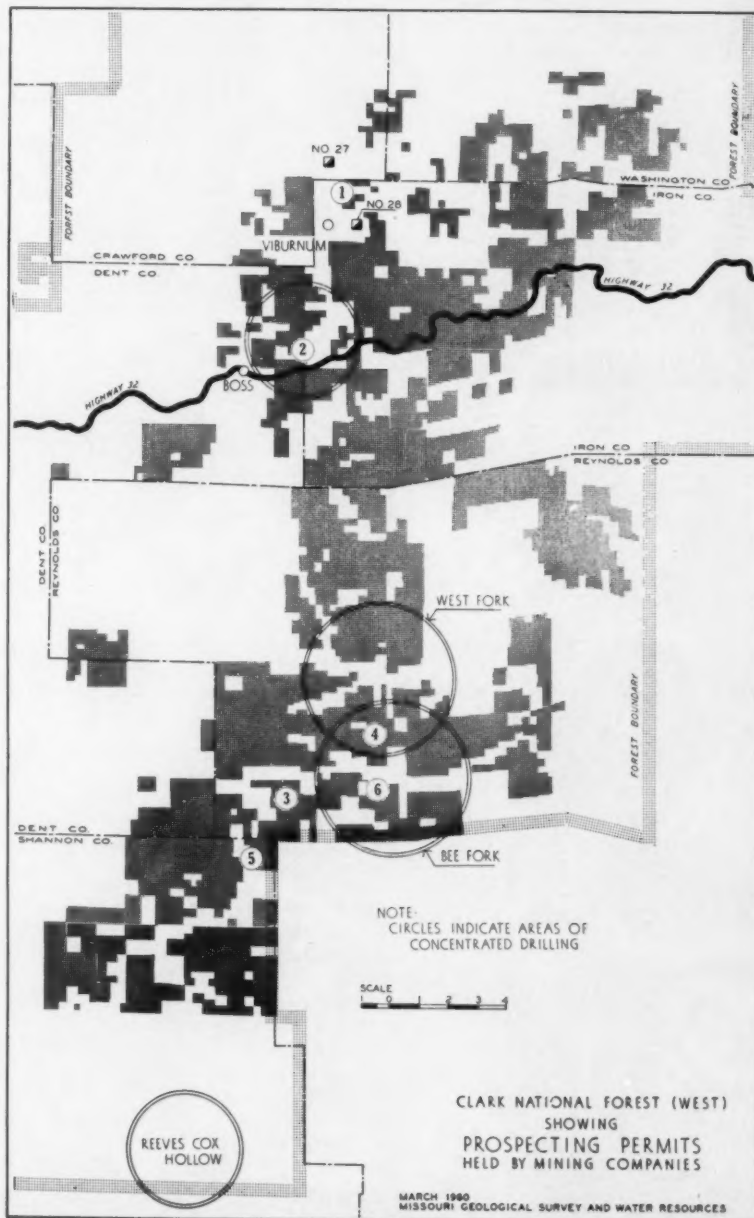
oped. Bear Creek also holds 56 leases to the northeast in Reynolds County.



No. 6 is the Logan Creek area where American Metal Climax, Inc. optioned seven tracts late in 1959 near the Lone Cedar School.

Also active in the Nos. 1, 2, 3, and 4 areas are the General Mining Company, and the New Era Mining Company.

Other options and leases have been taken on property not shown on the map by New-Fair Mining Company near Williamsville and east of Greenville, the National Lead Company in Perry and St. Francois counties, and the Ozark Ore Company in Iron County.

Continued drilling will find more ore in this area.





Day Time Sun

Miners are still flocking to Nevada for silver, but this time many are seeking it around the gambling tables of Las Vegas, instead of out on the hot, shimmering desert.

Those who attended the first Las Vegas AMC convention in 1955 will find the city greatly changed. Most obvious improvement will be the \$5,000,000 convention center which will house more than 185 leading manufacturers and suppliers of the latest in mining equipment.

Two special trips have been arranged for Friday, October 14, to give delegates a chance to see some of Nevada's mining operations. One party will leave by chartered plane for a 230-air-mile trip to Kennecott Copper Corporation's Nevada Mines Division at Ely. Here the group will visit operations at Ruth where 21,000 tons of ore and 45,000 tons of waste are removed daily, and where the new truck and skip haulage installation in the Liberty Pit are proving so satisfactory. After lunch, the group

will follow the ore cars to the reduction plant at McGill for an inspection of the mill and smelter operations which produce copper and molybdenum, and blister copper.

The other trip will include visits to several southern Nevada plants. Among these are the kiln plant and quarry of U.S. Lime Products Division; Stauffer Chemical, American Potash & Chemical, and Titanium Metals plants around Henderson; and the open-pit gypsum mine, plaster mill, and wallboard plant of Blue Diamond division of Flintkote Co.

As usual, the ladies are not neglected either. Fashion shows and luncheons will be held concurrently at the New Frontier and Riviera hotels on Tuesday, October 11. The same show will be presented at both hotels, but it is necessary to split the group this year because of the large attendance. On Wednesday, October 12, a reception will be held at the beautiful Las Vegas home of Mr. and Mrs. Joseph W. Wells.



Night Time Fun





Because so many top flight shows will be running during the time of the Convention, no evening entertainment events are planned by the AMC. The price is moderate and the only real problem is how to spread a short visit over so many enticing attractions. Here are a few that are scheduled at this writing:

The Folies Bergere at The Tropicana
Ice Show Spectacular at The Thunderbird
Le Lido de Paris Revue at The Stardust
Vic Damone and Harry James at The Flamingo
Red Buttons and the Mills Brothers at The Riviera
Tony Martin at The Desert Inn

Be sure to make reservations in advance. The AMC will have a special bureau set up to handle these. Most hotels stage two shows per evening, at 8:15 and midnight, although the Dunes has three per night and several others have three performances nightly on weekends.

Guests should arrive no later than 7 p.m. for the dinner show and 11:30 for the second show. All hotels insist that guests have dinner for the first show, which takes care of the minimum; most hotels have a \$4 or \$5 minimum for the second or cocktail show.


Don't overlook the lounges with such fascinating names as Lady Luck Bar, the Sinbad, the Topaz, the Showcase, or the Casbar. Most of these have top notch entertainment around the clock.





Vegas Vic Welcomes Miners

by Janet M. Taylor, News Editor



"Pit" Talk

Sooner or later the gambling bug will probably bite you and you'll have to try your luck in the casinos. There are many games to choose from—twenty-one, roulette, dice, race horse betting, bingo, keno, one-armed bandits (slot machines), to mention only a few. Don't forget famous downtown Fremont street . . . known also by such aliases as "Glitter Gulch," "Gay White Way of the West," and "The World's Largest Gambling Center."

Some words of warning before you lose your shirt!

First, get a strong grip on yourself. Defeat the inner voice that says you can become a millionaire overnight. Bigger purses than yours have bucked the House and found the scale too heavily weighed against them. You can't beat the odds decisively, but you might, just *might*, take away a small profit to brag about.

Second, decide the maximum you will lose and stick to it. If you violate this rule, nothing can help you except Fort Knox. It's better to allocate a certain amount for each day's playing so that you won't lose it all in the first session.

When you're ready to play, watch the game for a while. Games run hot and cold—that is, for stretches the House will win or lose fairly steadily (naturally winning more than they lose). Try to sit in on a game with a "cold" dealer or croupier; when he turns "hot," go to another table.

Your wins and losses will follow unpredictable cycles. Do not double when you lose—double when you win. Your possibility of winning twice in a row is greater than winning after a loss. Set a maximum you will lose on each table. When you lose it, go to another table. If you get ahead, put

aside some pre-decided portion of your winning, and if you get down to that, quit the table and go to another. This process will limit your loss at each table and if you hit a lucky streak will let you get away from the table ahead of the game. (Maybe, perhaps, could be, could be not.)

Above all else, if you catch yourself making a bet and thinking of the things you could buy with the amount of the bet **QUIT!** Never let the amount you are betting become large enough to be important to you. Nothing or no one can give you a system for winning, but if you follow these simple rules, you can control your losses and enjoy your visit.

So you can understand some of the jargon of those crowding around the dice tables, here are some of the terms you're likely to overhear.

Cinch: Gambling as viewed by the owner of any gambling device.

Con: To persuade forcibly and against good judgment.

Tout: Noun—Person who gives gambling advice in return for money or bet placed in his name. Verb—(to tout) To persuade by questionable but exciting logic.

Shill: Employee of the House who poses as a customer to keep table from emptying.

Jazzy Chass: A term of contempt used to describe a winner who is trying to get rich. Recognizable by a glazed look in the eyes and typified by heavy and ostentatious betting and/or spending.

Pigeon: A term of contempt used to describe a loser who is trying to get even by increasing his bets. (Example—Starting with a \$25 bet and doubling to get even. Six losses will put you \$1,575 in the hole; ten losses, \$25,575.)

Pit Boss: Foreman of dealers; can be observed lurking in the background smiling.



Technical Program

Speeches cover all segments of the minerals industries

Tuesday morning—October 11

EXPLORATION AND GEOLOGY

Chairman: James Boyd, Pres., Copper Range Co., Boston.
Vice Chairman: Roger H. McConnel, Chief Geol., The Bunker Hill Co., Kellogg, Idaho.

Mineral Resources on the Ocean Floor:

John Mero, Research Engr., Institute of Marine Resources, Inc., Univ. of Calif., Berkeley.

Metallogenic Maps of the United States:

Philip W. Guild, Chief, Base & Ferrous Metals Branch, U. S. Geological Survey.

How a Small Mining Company Can Pursue Mineral Exploration:

Karl J. Springer, mining exploration and development enterprises, Toronto, Ont., and Vancouver, B. C.

Geologic Reconnaissance of Large Areas Leading to Economic Appraisal:

E. E. Thurlow, Chief Mining Geol., Northern Pacific Railway Co., St. Paul.

A Large Company and Worldwide Exploration:

Glenn C. Waterman, Chief Geol., The Anaconda Company (Canada) Ltd., Toronto.

Discussion: Evan Just, Head, Dept. of Mineral Engineering, Stanford University, Stanford, California.

Tuesday morning—October 11

GENERAL OPERATING PROBLEMS

Chairman: Wesley P. Goss, Pres., Magma Copper Co., Superior, Arizona.

Vice Chairman: John Bley, Vice Pres., American Chrome Co., Nye, Montana.

Freeport's Off-Shore Sulphur Property at Grand Isle:

Paul D. Bybee, Gen. Supt., Grand Isle Mine, Freeport Sulphur Co., Grand Isle, La.

Preliminary Engineering and Water Control for the Caland Operation at Steep Rock Lake:

P. P. Ribotto, Vice Pres., Caland Ore Co., Atikokan, Ontario.

Use of Radio Communication in Small Mining Operations:

Arthur W. Woods, Mine Supt., Trace Elements Corp., Maybell, Colo.

Economics of Truck vs. Belt Haulage:

Peter Nalle, Mgr., Riverside Cement Co., Riverside, Calif.
D. M. Cooper, Senior Mining Engr., U. S. Borax & Chemical Corp., Boron, Calif.

Tuesday afternoon—October 11

OPEN PIT MINING

Chairman: Robert J. Linney, Pres., Reserve Mining Co., Silver Bay, Minn.

Vice Chairman: Willis H. Wamsley, Mine Supt., U. S. Borax & Chemical Corp., Boron, California.

Reynolds' Open Pit Mining of Bauxite in Arkansas:

Julian A. Fuller, Supt. of Surface Operations, and J. R. Krause, Chief Engr., Reynolds Mining Corp., Bauxite, Arkansas.

Discussion: Charles L. Boise, Asst. Supt., Isbell Construction Co., Sahuarita, Arizona.

Maintenance of Open Pit Equipment:

R. Y. Jensen, Asst. Chief Engr., The M. A. Hanna Co., Cleveland.

Economics of Various Methods of Overburden Stripping:

J. V. Otter, Engr.-Special Services, Morrison-Knudsen Co., Inc., Boise, Idaho.

Economics of Large Tires for Earthmoving Equipment:

G. E. Danby, Mgr., Sales Development, Euclid Div., General Motors Corp., Cleveland, Ohio

Tuesday afternoon—October 11

INDUSTRIAL ENGINEERING SYMPOSIUM

Chairman: Paul Dashine, Pres., Calumet Division, Calumet & Hecla, Inc., Calumet, Michigan.

Survey of Industrial Engineering in the Mining Industry:

R. M. Stewart, Dir., Mining Research, and S. W. Hurlbut, Senior Research Engr., The Anaconda Company, Butte, Montana.

Discussion Speakers:

Benton Boyd, Mgr., U. S. and Lark Mine, U. S. Smelting, Refining & Mining Co., Salt Lake City.

M. J. O'Shaughnessy, Asst. Gen. Mgr., Nevada Mines Div., Kennecott Copper Corp., McGill, Nev.

Charles A. Cleaves, Asst. Mine Supt., Climax Molybdenum Co., Climax, Colo.

Meredith Smith, Staff Mgr. of Industrial Engineering, International Minerals and Chemical Corp., Carlsbad, N. M.

Wednesday afternoon—October 12

UNDERGROUND MINING

Chairman: James S. Westwater, Vice Pres., Mining, Cleveland-Cliffs Iron Co., Cleveland, Ohio.

Vice Chairman: L. W. Casteel, Asst. Div. Mgr., St. Joseph Lead Co., Bonne Terre, Mo.

Mining Huge Ore Bodies in Sweden:

I. Janelid, Prof. of Mining, Royal Institute of Technology, Stockholm, Sweden.

Developments in Large Borehole Drilling:

H. E. Mauck, Vice Pres.-Operations, Freeman Coal Co., Chicago.

D. C. Ridenour, Gen. Supt., Olga Coal Co., Coalwood, W. Va.

Inland Converts Drum Hoist to Koepe Friction Type for Greater Depth:

J. R. Gronseth, Mech. Engr., Inland Steel Co., Ishpeming, Mich.

Special Features of Hoist Installation at the Galena Mine:

Norman Visnes, Supt., Galena Unit, American Smelting & Refining Co., Wallace, Idaho.

Slusher Operation in Narrow Veins:

William H. Harrison, Jr., Gen. Mine Supt., Aluminum Co. of America, Rosiclare, Illinois.

Wednesday afternoon—October 12

MILLING AND METALLURGY

Chairman: R. R. McNaughton, Mgr., Metallurgical Div., Consolidated Mining & Smelting Co., Trail, B. C.
 Vice Chairman: C. K. McArthur, Dir. of Met. Research, Utah Construction & Mining Co., San Francisco.
Instrumentation for Process Control in the Milling of Copper-Molybdenum and Potash Ores:
 George Atwood, Vice Pres. & Gen. Mgr., and J. P. McCarty, Duval Sulphur & Potash Co., Tucson.
Instrumentation of Plant Operations:
 R. G. Patterson, Production Mgr., California Portland Cement Co., Los Angeles.
The Krupp-Renn Direct Reduction Process:
 Max Kennard, Vice Pres., Southwest Engineering Co., Los Angeles.
Developments in Autogenous Grinding:
 Bunting S. Crocker, Vice President, Kilbourne Engineering Ltd., Toronto, Ontario.
Plastics in Metallurgy for Resistance to Abrasion and Corrosion:
 Wayne C. Hazen, Senior Research Engr., Kerr-McGee Oil Industries Inc., Denver.

Thursday morning—October 13

OPEN PIT MINING

Chairman: Walter C. Lawson, Vice Pres. & Gen. Mgr., Phelps Dodge Corp., Douglas, Arizona.
 Vice Chairman: Neil O. Johnson, Operations Mgr., Foote Mineral Co., Kings Mountain, N. C.
Open Pit Operations in the Gas Hills Area of Wyoming:
 Roy Coulson, Supt., Vitro Minerals Corp., Riverton, Wyo.
Scientific Techniques in Control of Open Pit Slopes:
 Adolph Soderberg, Consulting Mining Engr., Western Mining Divisions, Kennecott Copper Corp., Salt Lake City.
Cement Raw Materials—Variety in Mining:
 Edward B. Connors, Mining Engr., Permanente Cement Co., Oakland, California.
New Developments in Initiation of Blasts in Mining:
 Harlan J. Poel, Mgr., Technical Service Section, Explosives Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Innovations in Ammonium Nitrate Blasting:
 D. M. Stromquist, Tech. Repr., Coal Chemical Div., U. S. Steel Corp., Salt Lake City.

Thursday morning—October 13

UNDERGROUND MINING

Chairman: S. K. Droubay, Vice Pres., United Park City Mines Co., Salt Lake City.
 Vice Chairman: Donald T. Delicate, Asst. Mgr., Homestake Sapin Partners, Grants, New Mexico.
Practical Use of Rock Mechanics:
 Seth D. Woodruff, Civil Engrg. Associate, Dept. of Public Works, City of Los Angeles.
Alimak Raise Climber:
 B. R. Waples, Jr., Chief Engr., Shattuck Denn Mining Co., Humboldt, Ariz.
New Drifting Methods at Britannia Mine:
 Donald W. Pringle, Mgr., and Herbert Shuttleworth, Mine Supt., Howe Sound Co., Britannia Div., Britannia Beach, B. C.
Underground Ammonium Nitrate Blasting:
 A. V. Mitterer and Ben T. Phillips, Jr., International Minerals & Chemical Corp., Carlsbad, N. Mex.
An Application of Nuclear Detonations to Block Caving:
 William Flanges, Supt. of Tunnels, Nevada Test Site, Mercury, Nev.
 L. E. Shaffer, Prof. of Mining, Univ. of Calif., Berkeley.

Thursday morning—October 13

STATE OF THE MINING INDUSTRIES

Chairman: Hon. Howard Cannon, U. S. Senator from Nevada.
Policies and Procedures of the Tariff Commission:
 J. Allen Overton, Jr., Vice Chairman, U. S. Tariff Commission.
Nonferrous Metals:
 Simon D. Strauss, Vice Pres., American Smelting & Refining Co., New York.
Discussion:
 Clark L. Wilson, Chairman, Emergency Lead-Zinc Committee, Washington, D. C.
Iron Ore:
 C. F. Beukema, Pres., Oliver Iron Mining Division, U. S. Steel Corp., Duluth, Minnesota.
Light Metals:
 Lawrence Litchfield, Exec. Vice Pres., Aluminum Co. of America, Pittsburgh.
Industrial Minerals:
 Bernard J. O'Neill, Jr., Geol. Dept. of Earth Sciences, Stanford Research Institute, Palo Alto, California.
Special Metals and Rare Earths:
 Steve Yih, Vice Pres., Wah Chang Corp., Albany, Oregon.
Strategic Minerals:
 S. H. Williston, Exec. Vice Pres., Cordero Mining Co., Palo Alto, Calif.

Thursday afternoon—October 13

MILLING AND METALLURGY

Chairman: Jack H. How, Pres., Western-Knapp Engineering Co., San Francisco, California.
 Vice Chairman: Kenneth L. Tatman, Mill Supt., Idarado Mining Co., Telluride, Colorado.
El Salvador Mill of Andes Copper Mining Co.:
 Peter B. Hobsbawn, Mill Supt., Andes Copper Mining Co., Potrerillos, Chile.
Construction of the New Mill and Surface Plant of the Lucky Friday Mine:
 Gordon Craig, Mill Supt., Hecla Mining Co., Wallace, Idaho.
Iron Making by the Dwight-Lloyd McWane Process:
 Robert C. McDowell, Pres., McDowell Co., Cleveland.
Gravity Feed Heavy Media Cyclone:
 H. F. Kullberg, Mgr., Minnesota Ore Div., Jones & Laughlin Steel Corp., Virginia, Minnesota.
Developments in the Treatment of Rare Earths and Minerals:
 A. J. Kauffman, Jr., U. S. Bureau of Mines, Albany, Oregon.

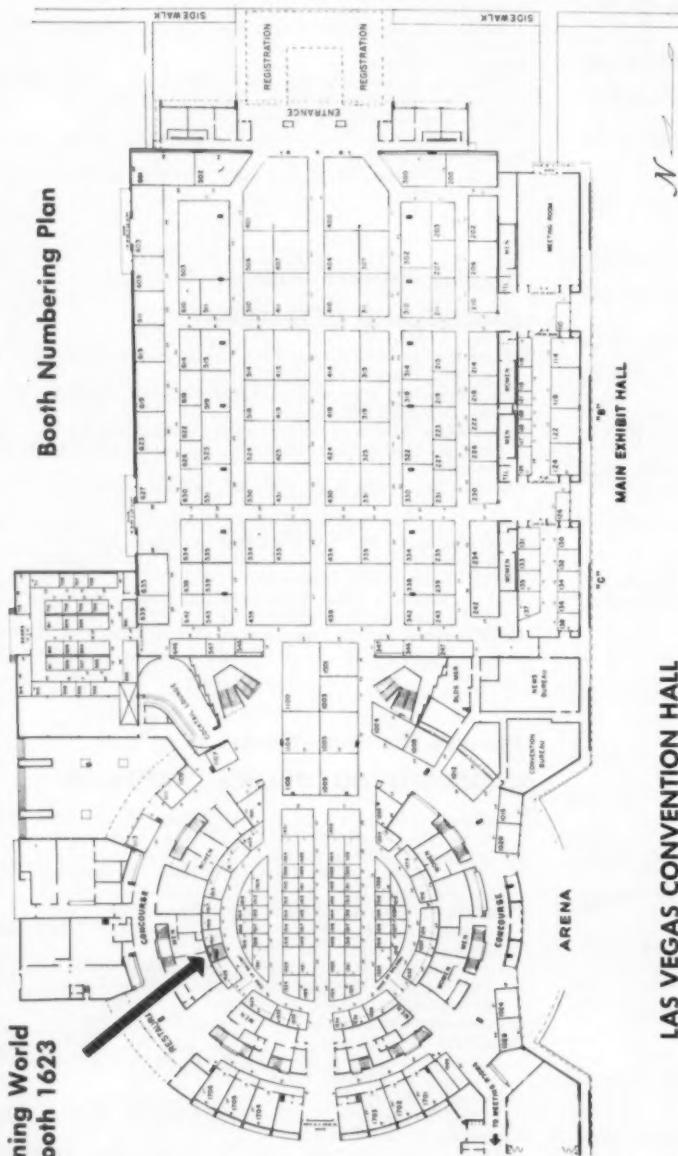
Thursday afternoon—October 13

UNDERGROUND DRILLING SYMPOSIUM

Chairman: Claude O. Dale, Asst. Gen. Mgr., Chemicals & Metals Div., Eagle-Picher Co., Miami, Okla.
Underground Drilling at Inco:
 J. H. Dewey, Drilling Research Engr., International Nickel Co. of Canada, Ltd., Copper Cliff, Ontario.
Panel on Drilling and Maintenance Practices:
 Moderator: F. J. Haller, Vice Pres.-Operations, North Range Mining Co., Negaunee, Mich.
 Co-Moderator: R. W. Persons, Mgr., Drill Steel Div., Crucible Steel Co. of America, New York; Chairman, AMC Underground Drilling Committee.
Introductory Discussions:
Scheduled Maintenance:
 Raymond Stewart, Asst. Planning Engr., Climax Molybdenum Co., Climax, Colo.
Overhaul and Repairs:
 E. B. Olds, Mine Supt., The Bunker Hill Co., Kellogg, Idaho
Education of the Driller:
 J. W. Clemmens, Gen. Operating Engr., M. A. Hanna Co., Iron River, Mich.
Pointers for Improved Underground Drilling Techniques:
 William C. Campbell, Asst. Mine Supt., Homestake Mining Co., Lead, S. D.

Mining World Booth 1623

Booth Numbering Plan



LAS VEGAS CONVENTION HALL

Your Guide to Mining Show

Here is your guide to the Mining Show and Machinery Exhibition at the new Convention Hall in Las Vegas, Nevada.

The exhibit plan above will help you locate each booth and show you how to reach it from any part of the building.

Don't forget the outside exhibit area where some new equipment for open pit mining will be displayed. This equipment is larger than ever and features loading machinery.

Exhibitors are listed on the following

in six standard categories. They are: Underground, Control and Laboratory; Ore Treatment, Open Pit, General Equipment and Supplies, and Exploration.

These divisions sound familiar, don't they? Yes, they follow the mining industry's standard which has been adopted for MINING WORLD's annual Blue Ribbon Equipment Awards.

Be sure and check each booth carefully because many will have equipment for several of the above categories.

Find your sales engineer friends by using the exhibitor's personnel list starting on page 68. This lists exhibiting

companies alphabetically and the names of all employees who will be stationed at the respective booth during the exhibit.

Remember you don't have to attend in person to find out all about the equipment being exhibited. Check the exhibitors and their equipment carefully if you won't be in Las Vegas. Complete the reader service postcard by listing the booth numbers and mail.

Win a diamond at the MINING WORLD booth, No. 1623. In fact you can win one each day of the exhibition. Stop at the booth and register for your diamond. Good luck!

MINING WORLD presents this preview of the Machinery Exhibits. Study this list so that you won't miss anything at Las Vegas. The Exhibit Plan at left shows you where to find each booth.

Exploration

Boyles Bros. Drilling Co., Ltd. (1111), D. R. Montgomery, introduces new models of underground and surface diamond drills and pumping units.

Christensen Diamond Products Co. (1204), Ned Miles, features a complete display of diamond coring bits, non-coring bits, and reaming shells. Also shown are various styles of step-type bits for increased penetration rates and core recovery. The company's percussion drilling equipment is on view for the first time.

Diamond Drill Contracting Co. (1614), L. J. Burrows, shows two ultra light-weight portable diamond core drills, the Mark 9 gasoline-operated surface drill, and the Super Scout air-operated underground drill, both one-man drills. New high recovery core barrels are also shown.

Electro-Technical Labs. Division of Mandel Industries, Inc. (115), Hubert Guyod, exhibits a complete set of Electro-Tech 12-trace reflection and refraction seismic instruments and two portable WIDCO loggers and related down hole tools for the investigation of surface drill holes.



Fairchild Aerial Surveys, Inc. (1413), F. W. Hinrichs, features visual presentation of various services available from Fairchild, particularly aerial photography, topographic mapping, aeromagnetic surveys and airborne gravity water surveys.

Geophysical Instrument & Supply Company (809), A. A. Danish, exhibits geophysical instruments for mining exploration and survey equipment, including magnetometers, ABEM TURAM 25 electromagnetic unit and EM gun, Geiger and scintillation counters, Kern theodolites, technical books, portable refraction seismographs, ultraviolet lights and miscellaneous geologist's field items.

Isotopes Specialties Company Division of Nuclear Corporation of America (709), Kenneth W. Newman, shows the Mining World Blue Ribbon Award-winning beryllometer for the quick and positive identification of all beryllium metals.

E. J. Longyear Company (1212), H. A. Kurtze, features the latest diamond core drilling equipment. New wireline core barrels and diamond bits are shown. Displays illustrate the company's contract drilling and its mining and geological consultation services.

Odgers Drilling, Inc. (906), M. A. Nelson, shows its ODI pumping unit, a diesel-powered, transmission driven, high pressure pumping unit with 2,000 watt generator for diamond drilling use, plus its hydraulically operated ODI under reamer and ODI casing cutter.

Willys Motors, Inc. (1104).



Wink Corporation (52), F. W. Wink, shows the Winkie diamond exploration and masonry core drill and diamond bits, weighing only 45 pounds. They have a speed of 2000 rpm and are capable of drilling all angle holes producing 15/16 inch diameter cores to depths of 200 feet.

General Equipment & Supplies

Acme-Hamilton Manufacturing Corporation (810), James V. Carlin, Jr., has a large stand-up display featuring various types of hose and belting used in mining, and showing steps in construction of belting. Descriptive literature on the company products is available.

Aeroquip Corporation, Western Division (114), T. Mosher, features a twenty-foot display showing Aeroquip high pressure hydraulic hose assemblies and self-sealing couplings for hydraulic power equipment.

Allison Division, General Motors Corporation (1005), H. N. Roberts, exhibits five models of its Torqmatic drives: the CT-3340 used in underground mining; CRT-3331 and CRT-3531, standard heavy duty versions of a forward-reverse cycling transmission; TC-500 torqmatic converter; and CLBT-5840 transmission used in mining trucks and scrapers.

Alloy Rods Co. (800), E. F. Iverson, features five demonstrations of the company's hard surfacing alloys, including the Wear-O-Matic process for semi-automatic application of alloys designed to resist impact and abrasive wear. Also shown are the Wear-Arc and Wear-Flame manual hard surfacing electrodes.

American Air Filter Co., Inc. (611), Robert D. Moore, exhibits dust control equipment for mining processing, including operating models of wet-collecting Type N and Type W Roto-Clones, and a working scale model of the new

Model B Amer-Jet, reverse-jet fabric dust collector.

Arcair Company (704), C. A. Ross, features continuous live demonstrations of Arcair metal removal torches. This patented process uses electric arc to melt and compressed air to remove the liquified metal. The only auxiliary requirements are a welding machine as a power source and compressed air from a shop line or compressor.

Boston Woven Hose & Rubber Co. (646), A. F. Cannie, features the new BostRon belting. The exhibit dramatizes the principal advantages of the new belting and shows other company advancements in belting construction. Industrial hose and V-belts are also shown.

Broderick & Bascom Rope Co. (1405).

Chapman Engineering Supply Corporation (615), William E. Chapin, displays

Armchair Information

You don't have to go to the Exposition to get data on any exhibit. Write the booth number which appears in the item on the PEP card following this section and mail to MINING WORLD.

Your Equipment Guide

"Broomwade" rotary air compressors for the first time in the United States. The compressors are manufactured in England.

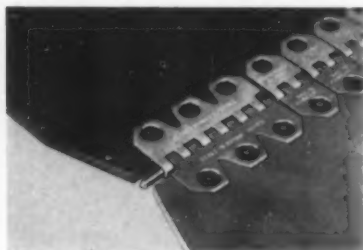
Coast Manufacturing & Supply Company (1618), F. W. Nelson, exhibits its latest safety fuse, detonating fuse and accessory developments. Information on field applications is available.

Conveyor Belt Service, Inc. (1215), W. A. Mars, shows a moving conveyor demonstrating the effectiveness of continuous belt repair. The company's other services in repairing and reconditioning conveyor belts are demonstrated.

Detroit Diesel Engine Division, General Motors Corporation (511-610), John G. Vanhoy, shows the following engines: model 4-53 industrial fan-to-flywheel engine; 6V-53 automotive fan-to-flywheel engine; 4-53 cutaway engine; 6V-71 cutaway engine; 12V-71 industrial fan-to-flywheel engine; and 6-110 fan-to-flywheel engine.

Farr Company (110), E. L. Williams, features the RotoPanic two-stage dry air cleaner, which is over 99 percent efficient on 5 micron size particles and above and is completely self-cleaning. Also shown is a working model demonstrating the cyclone action of the self-cleaning first stage.

Farris Flexible Valve Corp. (618), W. McGregor, shows flexible valves for abrasive or corrosive service, both hand operated and automatic. Also on display are Farris mil steam traps.



Flexible Steel Lacing Company (342), John Ramsey, exhibits an incline conveyor on which uses of the company's various conveyor belt fasteners are demonstrated. Also displayed are a new Flexco hinged fastener and countersinking tools.

Gar Wood Industries, Inc., (47).



General Cable Corporation (1415), W. W. Neumeyer, displays samples of mining cables, featuring Super Service portable

power and mining cables, along with photographs of actual field installations. A background map of the United States pinpoints the locations of the many General Cable sales offices and distributing centers.

General Electric Company (634-638).

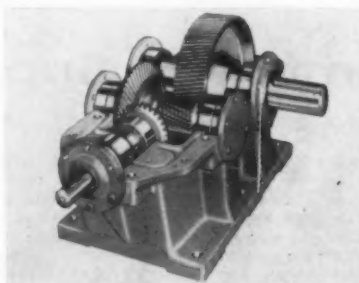
Goodman Manufacturing Company (1001), C. M. Graham, displays an intermediate section of 42-inch ropebelt conveyor for heavy-duty underground service. Component units are a new full-flex idler assembly, a hanging crowned return roller and adjustable rope-supporting stands. The company's Mancha Storage Battery Locomotive Division displays two locomotives for use in mine haulage.

The B. F. Goodrich Co. (539), John E. Pellegrine, shows the new BFG Nycord line of conveyor belts; a complete line of Koroseal PVC pipe and fittings; hose of all types; roto-stator replacement parts; sheet rubbers; and protective clothing. Koroseal welding is demonstrated.

The Goodyear Tire & Rubber Company (131), R. G. Abbott, has no exhibit. Their booth is used as a gathering place for friends and customers and is manned at all times by a large staff.

Griphoist, Inc. (1318), G. L. Robinson, shows unique quarter-size working miniatures of Griphoist model T-20 units actually lifting simulated miniature mining equipment. Also displayed are full-size units of Griphoist models T-35 and T-20, and pictures and sketches of actual job applications.

Brad Harrison Co. (119), W. B. Harrison, Jr., features single and multi-conductor electrical connectors integrally molded in Neoprene for 600 to 7,500 volt service. Photographs show various types and applications in actual service.

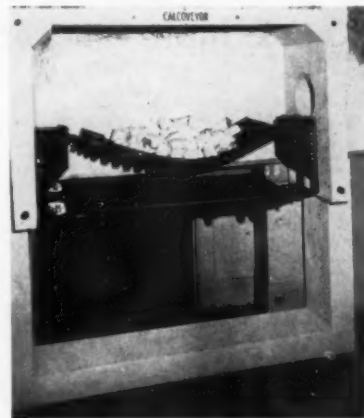


Hewitt-Robins Incorporated (1305, 1309, 1311, 1313, 1315, 1400, 1404, 1408, 1410, 1412, 1414), W. R. Needham, displays an operating 60-foot wire rope conveyor with a new hydraulic take-up designed to replace conventional weight take-ups. Also on view are high speed vibrating screen and a heavy duty vibrating feeder.

Intrusion-Prepakt, Inc. (1029).

Lubriplate Division, Fiske Bros. Refining Co. (247), H. E. Van Bevers, shows a complete display of mining lubricants, featuring multi-lube A, an all-purpose water- and acid-repellent grease.

Lug-All Co. (1220), DeWitt C. Cox, exhibits ½- to 2-ton hoists.



Frank J. Madison Company-Calco Supply Company joint venture (907), Frank J. Madison, shows a full cross section of the new prestressed concrete channel for conveyor belt support. The belt has a capacity of 600 tons per hour at a speed of 450 feet per minute.

Martin Engineering Company (126), E. H. Peterson displays "VIBROLATOR" vibration inducers, ball type and silent, for movement, sifting or compaction of materials, parts, slurries or concretions in hoppers, screens, bins, chutes and packaging operations. Also on display is a full line of vibration accessories and mounts.

McNally Pittsburg (1217), E. T. McNally, features the McNally cradle idler. A typical H-frame used to support the cradle idler and a replacement type idler are also displayed.

Motorola Communications and Electronics Inc. (1419, 1616), Don Brickley, shows the Motorola "MOTRAC," two-way transistorized mobile radio equipment, "Handie-Talkie" portable radio-telephone, pocket transmitter and receiver, closed circuit television for industrial use, and other company products.

National Chemsearch Corp. (707), Lester A. Levy, introduces a new safety solvent degreaser, SS-25, which is safe from toxic fumes and fire, and is approximately 25 times safer than carbon tetrachloride. It leaves no residue and completely eliminates greases and oils.

New York Rubber Corporation (1109).

Ohmart Corporation (710).

Raybestos-Manhattan, Inc., Manhattan Rubber Division (243), S. V. V. Hoffman, features its RAY-MAN conveyor belt for 45 degree idlers and the Poly-V power transmission drive, consisting of a new type belt with specially designed pulleys, combining the simplicity of a flat belt and the grip of V-belts.

Red Jacket Company, Inc. (121), George Raftis, shows a valve in operation. Also on view are the new reduced port sleeve and a special, high abrasion resistant

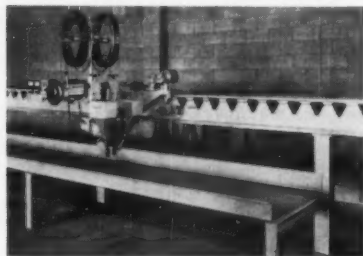
sleeve, which are being shown here for the first time. Latest company catalogs are available.

Rees Blow Pipe Mfg. Co. (1612). Walter S. Schamel, displays models and photographs of the company's line of air handling and dust control equipment, featuring fans, cloth tube dust arrestors, cyclone collectors and power shovel cab air filters. Literature on all Rees equipment is available.

Ridley and Company, Inc. (1113).

Sheffield Division, Armco Steel Corporation (1420).

Stephens-Adamson Manufacturing Co. (801). William E. Cousland, shows a sectional belt conveyor featuring bent plate decking; curve crown pulleys; belt conveyor holdbacks; belt cleaner; Sealmaster ball bearings; Sealmaster take-ups; Saco reducers; belt conveyor carriers; and belt conveyor return rollers.



Stoody Company (202-206). George F. Staley, shows a new automatic welding system in operation and gives manual and semi-automatic welding demonstrations featuring rebuilding and hard-facing. Rebuilt and hard-faced mining equipment is displayed.

Thermoid Division, H. K. Porter Company (1508).

Tool Steel Gear & Pinion Co. (1234). H. S. Mercier, exhibits complete lines of shovel gearing, crusher gearing, ball mill pinion gears, and loader gearing.

Twin Disc Clutch Co. (1312-1314-1316). Jack N. Yetter, features Gelenwellenbau universal joints. The 10,000 pound display shows the world's largest roller-bearing double universal joint in operation. Twin Disc transmission is also exhibited.

Union Wire Rope Corporation (1420). D. E. Bedford, exhibits its machine braided "Tuffy" slings, which are galvanized and made of high carbon wire. Also displayed are reels of "Tuffy" dozer, scraper, dragline and hoist line wire ropes and hand samples of slusher and mining machine ropes.

United States Rubber Company, Mechanical Goods Division (1012).

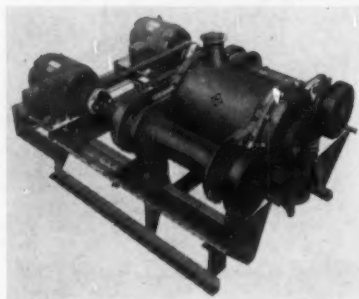
United States Steel Corp. (407-411). W. R. Fawcett, has an exhibit built around the theme of "Magic Metals in Mining." A magician presides over a series of new and different product presentations designed to inform and entertain,

illustrating uses of the 10,000 steels available to the mining industry.

Victaulic Co. of America (347). J. E. St. Clair, displays the MINING WORLD Blue Ribbon Award winning plainlock couplings and fittings for connecting plain end pipe. Also shown are standard, lightweight, snap-joint and rigid couplings and fittings.

Westinghouse Electric Corporation (310). Darrell Searls, shows "Products for Progressive Automation," including a full-size model of a standardized design for a portable switch house; Load-O-Matic a-c reactor mine hoist control; Moduline gearing; Lifeguard insulation; Guardistor overtemperature protection for motors; and Life-line H d-c motors.

Ore Treatment



Allis-Chalmers Mfg. Co. (415, 419, 514, 518). Robert Brown, exhibits a 736 crusher, a 30-inch vibrating mill, operating models of a conventional rod mill and loose rod deck vibrating screen, a model Twinducer gear drive rod mill, and photographs and demonstrations of industrial systems equipment, tractors, and engines.

American Cyanamid Company (1024). W. R. Trotter, features Accomite, Cyadyn, and standard gelatin dynamites, representative of Cyanamid's complete line of high explosives for open pit and underground mining. Also shown are chemicals for metallic and non-metallic flotation. Company technicians are available for discussion of mining and metallurgical problems.

Barber-Greene Company (622). J. E. Gleason, exhibits scale models of bulk material stockpiling and reclaiming systems, including a radial stacker, tripper, and shuttle conveyor, and operating

models of Telsmith Division equipment. Also shown are new heavy-duty belt conveyor idlers and operating models of the Telsmith Super-Scrubber, Gyra-sphere crusher and heavy-duty apron feeder.

Barrett, Haentjens & Co. (231).

Battelle Memorial Institute (1020). C. R. Tipton, Jr., has an operating model of a new process for purification and upgrading of rock salt, which utilizes thermoadhesive techniques for removing impurities from the crude mineral. Technical papers are available without charge.

Bixby-Zimmer Engineering Co. (1605). Walt Zimmer, features a moving display of stainless steel all welded rod screens, clearly illustrating the details of construction. The new "Twist-Rod" and "Flex-Rod" screens are also shown.

Buell Engineering Company, Inc. (1515). J. P. Vandenhoeck, displays three scaled working demonstration models of pneumatic classifiers—centrifugal, gravitational and gravitational-inertial units for efficient separation, sizing or dedusting of dry powdered materials.

Carrier Conveyor Division of Chain Belt Co. (601-603). N. E. Ledbetter, displays its new resonant screen, grizzly feeder and louver-bar screen. All of this equipment is specially designed for mining applications.

Chain Belt Co. (601-603). Robert F. Olson, features a Rex apron conveyor and several models of Carrier natural frequency vibrating screens and feeders. Also displayed are conveyor chain, sprockets, buckets, Shafer self-aligning roller bearings, idlers and pulleys.

Clarkson Company (1308). J. R. Clarkson, features reagent feeders in stainless steel and PVC, the new Tekwip proportioning pump for controlled feeding of liquids under pressure, and Flo Control valves models C and J for control of abrasives and corrosive slurries.

Climax Molybdenum Co., Division of American Metal Climax, Inc. (1513).

The Colorado Fuel & Iron Corporation (1004). J. R. Smolenske, features its traditional "Hospitality Center" for visitors to the show, including a secretary who will take letters and messages and help in any way possible. The booth will illustrate the products which the company manufactures for the mining industry.

Denver Fire Clay Company (1520). R. C. Shepard, exhibits its line of metallurgical clay goods, refractories, furnaces and burners. A new line of high temperature crucibles of zirconia, magnesia, and alumina is also shown for the first time.

Derrick Manufacturing Company (1633). H. William Derrick, Jr., shows high speed screening machinery for use in making high capacity separations in the fine mesh area, below one-half inch opening, with both wet and dry ores.

Armchair Information

You don't have to go to the Exposition to get data on any exhibit. Write the booth number which appears in the item on the PEP card following this section and mail to MINING WORLD.

Your Equipment Guide

Dorr-Oliver Incorporated (223), H. V. Vecsey, exhibits a working model SiphonSizer hydraulic classifier and Dorclone classifier equipped with Siphon-trol underflow control, operating in series to perform a three-product separation. Also shown is a DSM operating screen.

Dow Chemical Company (1609).

Equipment Engineers Inc. (338), L. A. Norman, Jr., features an operating Model D6B-12* Krebs Cyclone constructed of transparent plastics to allow visual observation of the internal flow pattern and separation of solids. Other single stage units and the integral two-stage Krebs Cyclone are also displayed.

Fairmont Machinery Company (122-124), J. W. Forman, shows a heavy duty LeccoVib inclined vibrating scalping screen and a LeccoVib vibrating conveyor. Also displayed is a new line of standard shock-resistant conveyor idlers. There is a pictorial presentation of the company's various types of material handling and processing equipment.

Filtration Engineers Division, American Machine and Metals, Inc. (1424), R. M. Hammes, exhibits a small production size filter equipped with oscillating type agitator, high capacity valve and top pivoted scraper blades, plus a wide assortment of natural and synthetic filter media and other industrial textiles.

The Galigher Co. (330), H. E. Wright, features the VACSEAL pump, Agitair flotation machine, Galigher acid-proof sump pump, Geary-Jennings Sampler, Galigher Delta valve and squeeze valve. Some of this equipment is shown in actual operation.

General Mills Inc., Chemical Division (137), Andrew W. Hanson, features a continuous liquid ion exchange (LIX) demonstration unit, showing the use of the latest techniques in the LIX recovery of vanadium employing the recently developed LIX reagent, Aliquat 336. Information on other General Mills flotation reagents is also available.

Hardinge Company, Incorporated (614), C. C. Nolan, shows five working models of its machines, including the new "Over-drain" classifier, Tricone mill, "Auto-Raise" thickener, disc-roll mill, and "Electric Ear" grinding mill control unit. A thirty-foot illuminated background features color photographs of some of the most recent Hardinge mining installations.

Humphreys Engineering Co. (635), Merrill Welker, displays a series of large photographs of plants using Humphreys spiral concentrators treating iron, titanium, chromium and similar types of ore.

The International Nickel Company, Inc. (1317-1319), G. H. Davis and W. R. Ferguson, features applications of Ni-Hard nickel-chromium abrasion-resistant iron in the grinding of metal ores. Also shown are uses of chromium-nickel stainless steels in refining applications, and Inco's new nickel mining and smelting operations in Manitoba.

Mine and Smelter Supply Co. (302), Donald J. Drinkwater, introduces two new products soon to be available for commercial applications, one in the field of comminution, the other for liquid removal, filtering and drying. Two commercial size machines are on display, showing mechanical construction and principle of operation.



National Iron Company (242), L. J. Carrier, shares a booth with Hammerrills and Universal Engineering Corporation. On display are working models of NICO apron feeders, and a continuous movie showing NICO rockover skip systems in operation.



Nordberg Manufacturing Company (203), E. L. Satola, shows two working models of Symons cone crushers and screens. Featured are two new products, "Nordbak," a revolutionary backing for manganese crusher parts, and "Protecto-Lube," a complete, packaged lubricating unit for crushing and process machinery.

Pioneer Engineering, Div. of Poor & Co., Inc. (623), Robert A. Johnson, features a cutaway Pioneer ore feeder, an extra-heavy duty feeder built to handle large tonnages of heavy, abrasive materials. Also on view are a Pioneer overhead eccentric jaw crusher and vibrating screen.

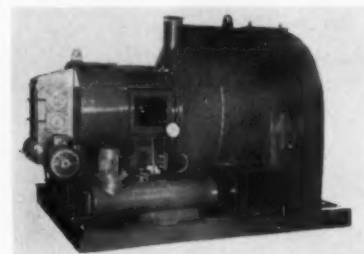
Stearns Magnetic Products (1216), D. F. Christnelly, features magnetic separators, including the Indox V permanent magnet pulleys and Indox V "WPD" separators for heavy media recovery. Information is available on the complete line of magnetic materials handling and separation equipment.

Traylor Engineering and Manufacturing Division, Fuller Company (211), R. F. Miller, exhibits full scale laboratory size gyratory and jaw crushers. Also shown are a rotary feeder for volumetric control, a section of Airslide® fluidizing conveyor, and an operating cutaway model rotary compressor.

The W. S. Tyler Company (227), Fred Braun, features the latest model Ty-Rock screen used in mining. Samples of woven wire screens of many different

metals and meshes are shown, together with Tyler standard screen scale testing sieves.

Universal Engineering Corporation (242), Ralph F. Murray, shares a booth with Hammerrills and National Iron Company. On view is a fully operating scale model of the famous Wobbler feeder, working models of apron feeders, hammerrills with moving breaker plate, and a three deck horizontal screen.



WEMCO, Div. of Western Machinery Co. (335-434), P. H. Mulcahy, shows a working model of the new Wemco-Kraut Jet Jig, a pneumatically actuated diaphragm-type unit for separation of particles too fine for H.M.S. and too coarse for concentration by flotation. Photographs of the new Wemco-Siebtechnik dryer are also shown.



Werco Steel Company (123), T. E. Bridgewater, shows the Tornado impact crusher manufactured in various sizes to take feeds from 8 inches down. It is very light in weight, easily installed and maintained, and has been used to reduce waste piles to commercially salable products.

Wheelabrator Corporation (1510-1512), K. E. Blessing, features the extensive applications for Wheelabrator cloth tube type dust and fume collectors. An operating model is displayed demonstrating the principle of repressuring to release collected materials from the surfaces of glass fiber filter tubes.

Underground

Alimak Corporation (1521), Jan Borgenhard, features the new Alimak raiser-climber, which provides a fully self-contained elevating system for driving raises from 40 feet up to 1,200 feet or more. It is faster and more efficient in every type of rock.

Alloy Steel and Metals Company (1213), John M. McKean, exhibits its new style,

removable wear shoes mounted on a 3B-42-2 Pacific Slushmaster scraper. Also shown is a complete line of sheave blocks, including the new R-T-C Round-the-Corner sheave block with new universal mounting bracket.

American Brattice Cloth Corporation (1219), D. Blaine Mikesell, exhibits its new MineDuct flexible tubing for exhaust ventilation systems. Also displayed is the company's regular line of brattice cloth, powder bags, ventilation tubing for blower systems, and trolley guard.

Asea Electric, Inc. (711).



Bemis Bro. Bag Co. (1635), I. D. Teter and W. B. Reed, shows flexible mine ventilation tubing developed by Bemis. Also displayed are other types of Bemis ventilation tubing, and explosives bags for ammonium nitrate and nitro-carbonate explosives.

Bethlehem Steel Company (535), W. S. Briscoe, displays yieldable mine roof arches and other steel mining equipment, including drill steel, mine roof bolts and accessories, wire rope, and track accessories. A unique contest for determining radioactive content in uranium ore samples will be open to all visitors to the booth.

Brunner & Lay, Inc. (1629), William Schaefer, exhibits carbide Rok-Bits, Carbo-Rok steel, master bits, drag bits, couplings, adapters, pneumatic tools accessories, rope thread tools and new HL-16 and 17 thread bits. Demonstrations show coupling and uncoupling of a string of rope thread tools.



The C. S. Card Iron Works Co. (1325), Robert G. Weaver, shows operating scale models of Card rocker dump type ore cars and automatic bottom dump skip. Photographs of other Card equipment are displayed.

Crucible Steel Company of America (1421-1425), R. L. Stark, displays six product panels showing hollow drill steel,

heavy duty coil springs, stainless and high alloy tubing, and other steel products. Highlight of the exhibit is a huge industrial coil spring, shown for the first time.

E. I. Du Pont de Nemours & Co. (547), E. L. Thayer, exhibits many of its blasting agents, with particular emphasis on the new "Acudet" delays and low-priced blasting agents.



The Eimco Corporation (401), Alfred F. Mansbach, features pictures of various Eimco products in action: the new Eimco 24 Rocker-Shovel, shown for the first time; 535 Conveyor Loader; 123 Front End Loader; Eimco-Belt continuous vacuum filter; Eimco-Burwell filter, and other Eimco products. Continuous motion pictures of Eimco products in operation will be shown.

Exide Industrial Division, Electric Storage Battery Co. (129).

Flygt Corporation (1016), S. L. Albertson, shows the complete Flygt line of pumps, featuring a working model of the B-38L, 1½-inch pump, and a cutaway version of the B-80L. Photographs of Flygt pumps in action and Roscoe, the sea lion mascot, complete the exhibit.

Gardner-Denver Company (1100), Carson L. Ruyle, shows many new products for the mining market, including new feed leg drill, mine carloader, line oilers, roof bolting drill, Mole-drill bits, and bit grinders. Also displayed are air hoists, air slushers, stopper drills, and the new Air-Trac drill.

The Gorman-Rupp Company (1200), Gilmore Hiett, displays submersible and high pressure pumps, diaphragm pumps and solids handling pumps used in the mining industry. Featured is the new submersible pump, model 3VS1-E5, a three inch pump powered by a 5 horsepower, 3450 rpm electric motor, weighing just 128 pounds.

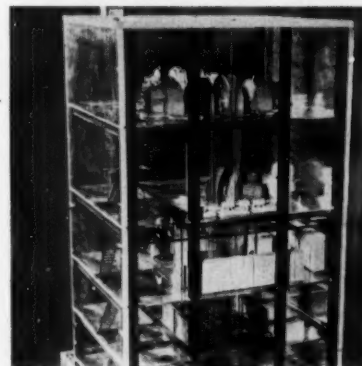
Gould-National Batteries, Inc. (346), J. S. McCullough, displays the Silconic Plate which delivers greater battery performance at lower cost for jeeps, mine locomotives, and shuttle cars, and lengthens

the life of underground industrial batteries by 10 to 25 percent.



Hughes Tool Company (1008), Leon B. Stinson, displays large diameter drilling and bits for blast hole drilling, plus a new and complete line of Hughes shaft cutters for drilling holes from 28 inches to 12 feet in diameter. "Rota-Blast" bits for blast hole drilling are also shown.

Jeffrey Manufacturing Co. (1321), L. H. McReynolds, has no equipment on display. The booth is manned by a large staff which will answer questions about the company's products.



Lake Shore, Inc. (543), James W. Clark, exhibits a new Jetline bottom dump skip that runs at any angle between 15 and 60 degrees; scale model of the Homer-Wauseca mine shaft at Iron River, Michigan, demonstrating the automatic gravimetric skip loading system developed by Lake Shore; and a watertight front discharge skip.

LeBus International Engineers, Inc. (1028), F. L. LeBus, Jr., exhibits movies showing the new LeBus system of counterbalance spooling wireline and restoring worn helical grooved cast iron or steel drums, accomplished right on the mine site.

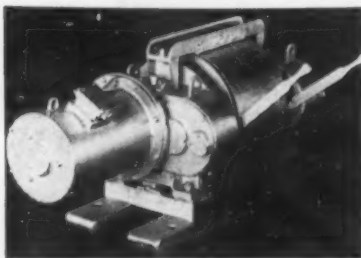
Leschen Wire Rope Division, H. K. Porter Co., Inc. (1504-1508), R. Rex Hartup, features an illuminated background of photographic enlargements of the new Leschen wire mill. Also shown are samples of the various types, sizes and constructions of Red-Strand wire rope for mining use.

Armchair Information

You don't have to go to the Exposition to get data on any exhibit. Write the booth number which appears in the item on the PEP card following this section and mail to MINING WORLD.

Your Equipment Guide

Macwhyte Wire Rope Company (1518), F. M. Sime, displays actual size samples of the many different wire ropes used in mining equipment. Various types of slings, cable assemblies, stainless steel wire rope, monel metal wire rope and plastic wire rope are also shown.



McCullough Equipment Co. (706), George McCullough, exhibits a new, low priced slusher imported from South Africa. The slusher was developed in the South African gold fields and is being introduced into the United States for the first time here.

Mine Safety Appliances Company (1401), C. M. Donahue, shows the newest Edison Model "S" electric cap lamp, transistorized audio tone transmission for remote control of fan, substations, etc., MSA MinePhone in conjunction with audio equipment and closed circuit television, and other mine safety equipment.

Mission Manufacturing Company (130-132), Ted Fullinwider, exhibits the Mission HAMMERDRILL, a bottom hole impact tool using air to develop a percussion action at the bit, which is particularly efficient in drilling through hard and medium-hard formations.

Motoramic Inc. (1232), Kurt M. Holm, shows the WEDA L200 and WEDA L3Z submersible drainage pumps featuring the new built-in, fully automatic overheat protection. This consists of bi-metal breakers which stop the pump when abnormally high temperatures occur.

National Malleable and Steel Castings Co. (502), H. H. Smith and J. F. Thomas, features rubber load suspension devices for mine cars. Also shown are the National NC-1 mine car truck, Willison automatic couplers, and Capitol Foundry Division's Naco alloy steel grinding balls and cast steel products.

National Mine Service Company (531), Gordon MacVean, shows Greensburg Diesel and electric locomotives, exhaust gas conditioners for underground Diesel equipment, Scandura P.V.C. conveyor belting, TorKar Diesel and electric shuttle cars, Marietta continuous miners, Clarkson "Redbird" conveyor chain for loaders and continuous miners, and other equipment.

Ohio Brass Company (626), J. H. Sanford, displays O-B expansion shells and plugs for roof bolting, trolley and feeder fittings, safety materials such as fused taps, ground clamps, and circuit interrupters, and various types of current collectors for mine locomotives.

Olin Mathieson Chemical Corporation, Energy Division (1613), J. C. Copps, presents an informative and colorful products exhibit featuring the new Super-Span and Tru-Spot electric blasting caps.



Plymouth Locomotive Works Division of the Fate-Root-Heath Company (56), T. F. Root, features a 7½ ton Plymouth FMD Mine-O-Motive in operation to demonstrate the controls and effectiveness of the exhaust conditioning equipment on the Diesel engine. Also exhibited are an extrusion machine and a cleaning machine for industrial use.

Sanford-Day Iron Works, Inc. (43), W. D. Moreman, features the Model No. TL 5.5 Transloader, plus movies showing the machine operating underground. Movies showing mine car haulage are also being shown. On view are model drop bottom and Granby cars, and picture illustrations of all equipment.

E. E. Stookey-Farrell Cheek Steel Company (905), E. E. Stookey, exhibits alloy steel mine car wheels featuring a Brinell hardness of from 350 to 400 on the tread and flange wearing areas. Also displayed are various wire rope fittings and bucket teeth.

Thor Power Tool Company (322), B. H. Johns, features two new high speed push feed drills with single-stage, power retracted feed legs, and two-stage manually retracted feed legs. Also shown are sinker rock drills; a new, compact mine loading machine; and a heavy duty, tractor-mounted ¾ inch hydraulic-controlled drill rig.

The Timken Roller Bearing Company (318), F. M. Barry, displays Timken tapered roller bearings, removable rock bits and alloy steel used in metal mining. Also shown are a cutaway Timken bearing-equipped mine car wheel, a cutaway heavy-duty type "AP" freight car and other mine car parts.

Vascoloy-Ramet Corporation (234), E. C. Lomax, displays a complete line of V-R carbide tipped rock bits, featuring a new series of throw-away bits developed especially for the New Mexico uranium field. These are of the push-on style and are available in conventional style or with blind center hole.

Vulcan Iron Works Company (1320), Bill Hawn, displays an operating model of a

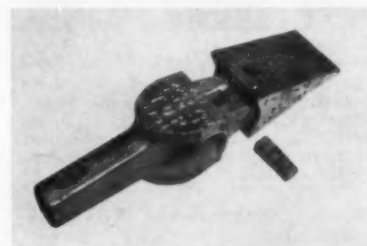
semi-automatic hoist designed for production duty in small mines. Other operating models of Zimmerman-type timber and material cages are on view.

Wagner Mining Scoop, Inc. (53), R. T. Wagner.

Western Rock Bit Manufacturing Co. (219), Maurice W. Hawkesworth, has a general display of the company's wide variety of percussion drill bits, both "used to destruction" steel bits and "used to destruction" carbide insert bits. Also shown is the new vacuum type rock bit for roof bolting in coal.

Open Pit

Allis-Chalmers Manufacturing Company, Construction Machinery Division (415, 419, 514, 518), Daniel E. Cavanaugh, shows the 225 horsepower HD-1 crawler tractor with torque converter drive; HD-6G crawler tractor shovel; and TL-14 wheel loader with Tractomatic drive.



American Manganese Steel Div. (235), N. M. McGuire, displays the Amsco "Simplex" two-part tooth for mining use, plus a variety of ball and rod mill liners made of a new alloy. Also shown are Amsco Nicro-Mang and Amsco X-53 for hardfacing use.



Atlas Copco Pacific, Inc. (627), W. D. Marshall, features the new portable rotary screw compressor, Model No. PR-6 (600). Also displayed are the ER-6, 1140 C.F.M. stationary compressor; a complete range of rock drills; the Cobra motor drill, and an array of Coromant tungsten carbide bits.

Atlas Powder Company (1228), J. H. Dannenberg, features Atlas Pellets, a completely new physical form of low cost ammonium nitrate. Several new explosives, including a pressed blasting agent for wet holes, are also exhibited. Demonstrations of the Rockmaster millisecond delay electric blasting cap series are given, with actual firing of the ignition element.

Armchair Information

You don't have to go to the Exposition to get data on any exhibit. Write the booth number which appears in the item on the PEP card following this section and mail to MINING WORLD.

Through Convention Hall

Baldwin-Lima-Hamilton Corporation (619), T. A. Griffin, displays large lighted color transparencies of its construction equipment for the mining industry. They feature shovels, cranes, draglines, and crushing and screening equipment. Working scale models of some equipment are on view.



Bucyrus-Erie Co. (314), Frank T. House, features scale models of its new 8- to 18-yard quarry and mine shovel and a new wheel excavator. Photographs highlight other B-E mining equipment, including the giant 115-yard stripping shovel now being built. Also shown is a new electrical control system for electrically powered quarry-mine machines.



Caterpillar Tractor Co. (315, 319, 325, 331, 414, 418, 424, 430), Harry W. Siebels, exhibits several new track-type tractors and accessory equipment, plus two sizes of their new Traxcavator line of front-end wheel loaders.

J. I. Case Company, Industrial Division, (210), D. A. Milligan, exhibits a Model 420 crawler tractor featuring a power angling dozer, and a 100 HP Model 1000 tractor shovel with $1\frac{1}{2}$ cubic yard bucket designed for heavy duty work, with the exclusive Case Terramatic drive.



Challenge-Cook Bros. Inc. (23, 25, 27), W. L. Walsh, displays the "Earthking" bottom dump hauling unit for off-highway work, with a 45-ton payload capacity, and the C-B "Stabilift," an end dump semitrailer especially built for quarry work.

Chicago Pneumatic Tool Company (33-62), Joseph B. Tiffany, features the company's latest drilling equipment, including the G-900 Tracdrill, a crawler-mounted percussion-type rig; the C-350

Mining World (1623), Henry C. Grundstedt, points up its international character with a huge world map showing the locations of its representative offices in 50 countries. A daily contest (guessing how many diamonds are in the fishbowl) awards a real diamond to each day's lucky winner.

REICHdrill, a completely self-propelled crawler-mounted unit; and the CP-5 Inhole Drill designed for hard rock percussion drilling.



Clark Equipment Company (214-230), Joseph L. Dorfler, displays the 600 horsepower Michigan Model 480 tractor dozer, the Michigan 280 tractor dozer, and the Michigan 275A tractor shovel. Also on continuous view is a new safety film which was produced with the cooperation and endorsement of the National Safety Council.



Cummins Engine Company, Inc. (515-519), J. D. Gatten, shows its new turbo-charged 700 horsepower VT-12 Diesel engine, plus two new eight cylinder V type Diesel engines. Other Cummins Diesel engines are also displayed.

List information
you want MINING
WORLD to obtain for
you on this card. WE'LL
DO THE REST. No
postage necessary
if mailed in U. S.

NOT GOOD IF MAILED AFTER NOVEMBER 25

Please have exhibitor send me literature displayed at the Las Vegas Metal Mining Show.
I want information on products displayed at booth numbers listed below.

Booth No.									

Name Title

Company

Address

IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business
(Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position
(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

Use this section to subscribe only

Sign here if you wish to subscribe to MINING WORLD
☐ 3 years, \$8 ☐ 2 years, \$6 ☐ 1 year, \$4 (Add \$1 per year if outside U. S., Canada, Latin America)

Your Equipment Guide

Clark Equipment Company, Automotive Division (1003).

Davey Compressor Company, Rotary Drill Division (55), L. W. Darling, exhibits the Davey Model M4-A blast hole drilling rig, which has a rated capacity of 4½-inch diameter holes to a maximum depth of 250 feet.

Differential Steel Car Company (81), H. Fort Flowers, shows a three-unit train, each unit equipped with side dump bodies dumping to either side, and controlled selectively from the cab. The tractor and both trailers have 10-yard capacity bodies.

Electric Steel Foundry Company (523), Henry Swigert, exhibits new ripper shank and point featuring radical new design to permit ripping under conditions formerly deemed impossible for ripping. The ripper points are cast in the new ESCO alloy steel.



Euclid Division, General Motors Corp. (307, 311, 400, 406, 410), R. H. Rogers, features two new units, the 211 horsepower C-6 crawler and the SS-33 scraper. Also shown are the TC-12 twin crawler and a large rear dump.

H & L Tooth Company (118) E. E. Drysdale, displays two-part Hammer forged alloy steel teeth for two-yard to

nine-yard dippers used in open-pit mining. Also shown are replaceable wear plate adapters and other excavating teeth and adapters used in strip mining operations.

Harnischfeger Corporation (503), Louis A. Flora, features a giant cab from a standard eight-cubic-yard P&H Model 1800 electric shovel, completely rigged with authentic control console and electronic control cabinet. Visitors may enter the cab, manipulate the controls, and view a movie through the cab window which gives an operator's-eye-view of the shovel at work.

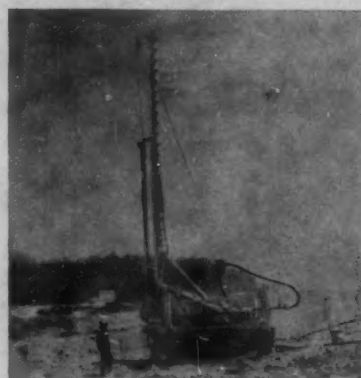
Herb J. Hawthorne, Inc. (1417), W. A. Davidson, shows the "Blue Demon" line of all-formation drill bits for shot hole, blast hole, core hole, and exploratory rotary drilling. A series of four bodies provides a complete range of sizes; low-cost hard-faced or tungsten carbide blades are designed to be worn out and thrown away.

Hercules Powder Co. (1517-1519), George B. Boesert, displays the "Hercol" series of low-cost, cap-sensitive, high-ammonia-content explosives, and the "Bulldog delay" series of blasting caps.



The Frank C. Hough Co. (9) H. R. Brown, features its "Payloador" Model

H-120 tractor-shovel and D-120 dozer. The H-120 is rated at 12,000 pounds carrying capacity and is used for truck loading, digging, stockpiling, and stripping. The D-120 is a new addition to the Hough line.



Ingersoll-Rand Company (508-510), T. Slager, shows the new Crawlmaster, several sizes of new hoists, a new pump, an XLE stationary compressor with new Tendomatic control, new jackdrill and stoper, four improved sizes of downhole drills and some new designs in Carset bits.

International Harvester Company (435, 439, 534), R. G. Greer, shows four construction equipment units and three International trucks, featuring the TD-25, newest heavyweight crawler manufactured by the company, the TD-15 steel mill special crawler, and the TD-9 and TD-6 underground mine crawlers.

Libu Shovel Co. (36), Nils G. Mornestam, exhibits the Libu three-way dump bucket, a world-patented Swedish invention. Its unrivalled digging characteristics and side dumping reduce driving distance and cycle time, and also reduce wear on tracks, tires, and engine.

Link-Belt Company (215), Arthur H. Boike, displays a model of a wheel now in operation in Neyveli, India. Also exhibited are new 35-degree troughed belt conveyor idlers and latest material handling equipment and power transmission components for mining.

Postage
Will be Paid
by
Addressee

No
Postage Stamp
Necessary
if Mailed in the
United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT No. 1456, San Francisco, Calif.

MINING WORLD—WORLD MINING

500 HOWARD STREET

SAN FRANCISCO 5,

CALIFORNIA

U. S. A.



List information
you want MINING
WORLD to obtain for
you on this card. WE'LL
DO THE REST. NO
postage necessary
if mailed in U. S.



Joy Manufacturing Company (200-300), R. E. Kinter, shows new equipment including a rotary-percussion underground rock drill; TDH crawler percussion drill; Joy-Hazemag impact crusher; 965-BH Champion rotary drill for angle-hole drilling; new controls for slushers; and wire-line retractable core-barrel tools.

Kennametal Inc., (642), John P. Steel, features large crushing rolls of Kennametal tungsten carbide; a new drag bit for well and blast hole drilling, a tungsten carbide hardfacing named Kenface, tungsten carbide nozzles, and various other tools for mechanized mining.



Krupp International, Inc. (45, 72, 74, 76), Heinrich Heep, exhibits its bucket-wheel excavator which has a maximum output of 470 cubic yards per hour and a maximum cutting height of 31 feet. A staff is present at the booth for consultation on mining questions.

KW-Dart Truck Co. (425, 431, 524, 530), W. C. Clayton, exhibits the world's largest end dump truck available to the mining industry, constructed of special high-strength steel. It has a gross vehicle weight of 300,000 pounds, and is capable of delivering over 700 horsepower.

Le Roi Division, Westinghouse Air Brake Co. (21), Ralph B. Malsom, exhibits a new line of drilling rigs and hand-held air tools for use by the mining industry.

R. G. LeTourneau, Inc. (3, 5, 639), S. H. Fain, shows a new huge front end loader with a 26-yard bucket designed for quick loading of dump trucks, electrically powered and controlled. Movies of the trolley-operated rear dump truck under test at the Anaconda Company's Berkeley pit in Butte are also shown.

LeTourneau-Westinghouse Co. (37, 39, 66, 68), Dan Burke, features the new 55-ton Haulpak truck, as well as the 32 ton model. Also shown is a 660 Power-Flow motor grader. On display are cut-aways, animated and photo exhibits, and literature racks.

Machinery Center, Inc. (7), K. A. Lehner, exhibits a new self-loading transport unit of approximately three tons capacity, powered by a Diesel engine. Its primary use is for underground gathering in non-abrasive materials such as uranium ores, salt, and potash. New designs in airlegs and other company products are displayed.

Mack Trucks, Inc. (17), A. G. Crockett, shows two completely new rear-end dump trucks: the M45SX 40-ton, six wheel unit with two-man cab; and the M30X, 30-ton, 18-yard capacity, two-axle truck. Also exhibited is another truck, the B813SX, an on- and off-highway six-wheel dumper chassis.

Marion Power Shovel Company (1601), Ed Marinik, displays new tubeless, static electronic controls for Marion excavators. Also shown are a quarter-inch scale working model of a 151-M 7 cubic yard shovel, and photographs of various Marion excavators.

Orenstein-Koppel und Lubecker Maschinenbau (13), Arthur H. Boike, exhibits a full-sized bucket wheel excavator.

Oshkosh Motor Truck, Inc. (438).

Parkersburg Rig & Reel Co. (911), William M. Kott, displays the "Hydrotarder Brake," a durable and dependable partner for conventional brakes, for use with trucks, tractors, hoisting equipment, mining and heavy duty construction operations.

Propellex Chemical Division, Chromalloy Corporation (811), Alfred E. Pickard, features its new SAF-T-BOOST primer for detonation of ammonium nitrate-fuel oil blasting agents. This primer has a high detonation velocity, over 20,000 feet per seconds, and weighs only 2/3 pound.

John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation (546), Walter A. Huber, displays typical wire ropes for mining uses against a colorful, illuminated background.

Schramm, Inc. (69), Robert P. Henry, exhibits two new drilling rigs, both designed for one-man operation: the C42 Crawler ROTADRILL, a highly maneuverable track-mounted rig, and the 250 PNEUMATRATOR, hydraulically operated and self-propelled.

Smith Tool Company (1621), James A. Bouterse, shows the company's newest air-circulation and jet-type circulation rotary bits, plus latest improvements in rotary mining bit design and large diameter hole drilling tools.

Spencer Chemical Company (1509), Charles M. Cooley, has an exhibit key-noting the use of ammonium nitrate as a basic constituent in field-compounded blasting agents. Also shown is a pneumatic loading machine now being widely used in the United States.

United States Steel Corporation, Ammonium Nitrate Div. (1617), C. W. Bourg, illustrates the use of USS ammonium nitrate in the mining industry with a replica of a drill hole loaded with oil-treated ammonium nitrate and large

full-color photographs of its use and results. A continuous slide presentation shows procedures in the use of field-mixed blasting agents.

Varel Manufacturing Company (1514-1515), John P. Millet, shows a complete line of rotary drilling tools, featuring its new concept in mining bit design, the new 9-inch VQM type bit. This bit has 35 percent more cutting capacity and contains greater amounts of Varelloy hard metal.



Western Contracting Corporation (29), L. Garland Everist, open pit stripping and mining contractor, exhibits one semi-trailer end dump truck currently used in its operations. The 80-yard hauling unit is powered by two GM 12V-71 Diesel engines developing a total of 850 horsepower.

Control & Laboratory

Industrial Nucleonics Corp. (1208), Paul M. Werth, shows the Mining World Blue Ribbon Award-winning AccuRay continuous flow density system, which continuously measures and controls pulp flows.

Industrial Physics and Electronics Co. (609), C. M. Marquardt, features the Con-O-Weigh compact weighing feeder, the Con-O-Weigh pneumatic-electronic continuous ball and disc integrator, and time modulated reagent feeding system for feeding liquid or slurried reagents. Detramp electronic iron detector and two models of the Transist-O-Trol transistorized probe switch are displayed.

Ramsey Engineering Co. (1619), R. C. Cahill, shows special instrumentation and control systems for the mining industry, featuring demonstrations of the Ramsey conveyor scale. A unique ore inventory computer and level indicator for use in solids storage is also displayed.

RKL Controls, Inc. (1107), Robert K. Little, exhibits operating models of its complete line of pinch type valves and vibration joints, including manual, hand lever, hand wheel, and electrically operated valves.

Standard Steel Corporation (239), Clay C. Hopper, shows a new and highly versatile pilot dryer, especially designed for use in making pilot plant studies. The dryer will test dry material under a variety of flows, temperatures, and flight arrangements, and has a special refractory lining so that it can be used as a rotary kiln.

Sales Engineers Who Will Be Glad To

Acme-Hamilton Manufacturing Corporation (810) Raul Camou, James C. Carlin, Jr.

Aeroquip Corporation (114) R. Baerresen, T. Fitch, T. Mosher.

Alimak Corporation (1521) Jan Borgenhard.

Allis-Chalmers Mfg. Co. (415, 419, 514, 518) J. E. Dunn, A. K. Boszhardt, F. E. Briber, Robert Brown, W. A. Shockley.

Allis-Chalmers Mfg. Co., Construction Machinery Division (415, 419, 514, 518) Daniel E. Cavanaugh, V. M. Holloway, E. J. Mercer, J. T. Skinner.

Allison Division, General Motors Corporation (1005) W. C. Edwards, H. N. Roberts.

Alloy Rods Co. (800) E. F. Iverson, J. M. Pierce, E. R. Walsh III.

Alloy Steel & Metals Co. (1213) C. W. Eichhorn, J. E. Flesch, P. R. Francis, John M. McKean.

American Air Filter Co. Inc. (611) J. M. Kane, J. G. Liskow, R. D. Moore, G. C. Rodgers, L. G. Samuels, H. E. Soderberg.

American Brattice Cloth Corporation (1219) L. K. Marshall, D. Blaine Mikesell.

American Cyanamid Company (1024) William H. Bowman, J. R. Burkett, F. A. Griffin, Borden Putnam, W. H. Trotter.

American Manganese Steel Div. (235) Tom Baker, Harry Bauman, J. Brandenburg, N. M. McGuire, Norm Molyneux, G. Ward.

Arcair Co. (704) William Bajari, C. A. Ross, R. R. Ross.

Atlas Copco Pacific, Inc. (627) C. E. Burton, C. W. Ferris, J. E. Heuser, Martin James, W. D. Marshall, J. R. Thornton.

Atlas Powder Company (1228) M. E. Colson, J. H. Dannenberg, R. K. Gottshall, W. L. Reinhart, J. L. Romig, G. W. Thompson, S. M. Wilson.

Baldwin - Lima - Hamilton Corporation (619) T. A. Griffin, J. W. Hardesty.

Barber-Greene Company (622) J. E. Gleason, H. W. Newton.

Battelle Memorial Institute (1020) J. S. Boylan, E. W. Himsforth, D. C. Minton, A. C. Richardson, O. F. Tangel, C. R. Tipton, R. Q. Wilson.

Bemis Bro. Bag Co. (1635) W. B. Reed, I. D. Teter.

Bethlehem Steel Co. (535) W. S. Briscoe, L. B. Gillette, G. M. Huck, G. P. Mahood, T. E. Neff, E. E. Roecker, F. T. Saunders, M. P. Schrauger, M. A. Thompson, J. B. Warner.

Bixby-Zimmer Engr. Co. (1605) K. R. Bixby, C. G. Rose, W. H. Zimmer.

Boston Woven Hose & Rubber Co., Div. of American Biltrite Rubber Co. (646) Allen F. Cannie, Randolph H. Jackson.

Boyles Bros. Drilling Co. Ltd. (1111) D. R. Montgomery.

Brunner & Lay, Inc. (1629) Fred J. Brunner, J. A. Klemeyer, John Neamand, William Schaefer.

Bucyrus-Erie Co. (314) L. C. Black, R. P. Brooks, H. Freyensee, Frank T. House,

J. V. S. Norton, J. H. Sackett, H. J. Vines.

Buell Engineering Company, Inc. (1515) M. L. Cassier, S. Specht, J. P. Vandenhoeck.

The C. S. Card Iron Works Co. (1325) Richard S. Button, Robert G. Weaver.

J. I. Case Company, Industrial Division (210) R. V. Aspeland, D. E. Fricker, Harlon Hanson, Harold G. Kilb, A. L. Light, J. L. Lucken, D. A. Milligan, G. E. Novlan.

Caterpillar Tractor Co. (315, 319, 325, 331, 414, 418, 424, 430) Jack Catalane, M. E. Fearis, Lou Flora, Walter Harnischfeger, H. W. Siebels.

Chain Belt Co. (601-603) Robert E. Carrier, Robert Lange, Robert F. Olson, Gilbert J. Schuelke, Robert E. Wren.

Chain Belt Co., Carrier Conveyor Division (601-603) N. E. Ledbetter, J. M. Morris, Al Mosschoot.

Challenge-Cook Bros. Inc. (23-25-27) J. E. Hall, F. W. Kirksey, C. W. Tilden, William L. Walsh.

Chapman Engineering Supply Corporation (615) W. E. Chapin, E. L. Chapman.

Christensen Diamond Products Co. (1204) Swede Augustson, Don Fraser, William I. Harris, Ned Miles, Phil Nelson.

Clark Equipment Company, Construction Machinery Division (214-230) J. L. Dorfler, C. G. Kennedy, C. E. Killebrew, W. V. Richards, A. E. York.

The Clarkson Company (1308) Pete Casal, J. R. Clarkson, L. A. Norman, Max Quigley.

Coast Mfg. & Supply Company (1618) F. W. Nelson.

The Colorado Fuel & Iron Corporation (1004) M. L. Alter, T. F. Bryant, H. M. Dorward, David L. Lee, H. K. Schmuck, R. L. Scott, J. R. Smolenske.

Conveyor Belt Service, Inc. (1215) James C. Heinz, R. S. Mars, Jr., W. A. Mars.

Crucible Steel Company of America (1421-1425) A. R. Glienke, R. W. Persons, R. L. Stark, J. A. Wagg.

Cummins Engine Company, Inc. (515-519) C. R. Boll, J. D. Gatten, J. P. Morgan, B. C. Sears.

Davey Compressor Company, Rotary Drill Division (55) C. E. Bridges, L. W. Darling, R. E. Throne.

Denver Fire Clay Company (1520) G. G. Gerbig, R. C. Shepard, W. C. Ware.

Derrick Manufacturing Co. (1633) H. William Derrick, Jr.

Detroit Diesel Engine Division, General Motors Corporation (511-610) A. F. Brecht, R. L. Burpee, D. J. Clymer, Robert E. Hunter, F. A. Skells, J. Thornton, John G. Vanhoy, H. F. Wooster.

Diamond Drill Contracting Co. (1614) L. J. Burrows, R. L. Carlson.

Differential Steel Car Company (81) Fred F. Flowers, H. Fort Flowers, Shelly G. Hughes.

Dorr-Oliver Incorporated (223) H. V. Vecsey.

E. I. DuPont de Nemours & Co., Inc.

(547) E. L. Thayer.

The EIMCO Corporation (401) Wayne L. Dowdey, Alfred F. Mansbach, Joseph Rosenblatt, Daniel Schwartz.

Electric Steel Foundry Company (523) Norval Grubb, Gordon Ley, Dean Naylor, Paul Robinson, Ted Smith, Henry Swigert.

Electro-Technical Labs. (115) Hubert Guyod, Bryant Tickell.

Equipment Engineers Inc. (338) F. C. Green, Jr., Richard Krebs, L. A. Norman, B. B. Winn.

Euclid Division, General Motors Corp. (317, 311, 400, 406, 410) J. W. Bloomquist, R. E. Keidel, G. M. Perry, R. H. Rogers.

Fairchild Aerial Surveys, Inc. (1413) F. W. Hinrichs, W. C. Kellogg.

Fairmont Machinery Company (122-124) J. W. Forman, A. W. Rich, J. W. Wantling.

Farr Company (110) John Breathed, G. F. Thruelson, E. L. Williams, Ric Williams.

Farris Flexible Valve Corp. (618) W. McGregor.

Filtration Engineers Division, American Machine and Metals, Inc. (1424) Sperry Ehlers, R. M. Hammes, Leo A. Jauhola.

Flexible Steel Lacing Company (342) Elmer Asbridge, Milton B. Beach, John A. Marshall, John Ramsey.

Flygt Corporation (1016) S. L. Albertson, T. R. Bengtson, B. Bjernfalk, A. G. Gillespie.

The Galigher Co. (330) S. L. Evans, A. F. Naisbitt, J. T. Potts, H. E. Wright.

Gardner-Denver Company (1100) N. M. Fishback, R. H. Ganz, G. W. Gutekunst, G. V. Leece, C. L. Ruyle.

General Cable Corporation (1415) W. W. Neumeyer.

General Mills, Inc. (137) A. W. Hanson, J. E. House, W. A. Jordan, A. G. de Meurisse, D. E. Terry.

Geophysical Instrument & Supply Company (809) A. A. Danish.

Goodman Manufacturing Company (1001) M. Cunningham, H. Goodman, W. Goodman, C. M. Graham, O. Littrell, C. McWhorter, J. Newton.

Goodman Manufacturing Company, Mancha Storage Battery Locomotive Division (1001) J. Appleton, C. M. Graham, O. Littrell.

The B. F. Goodrich Co. (539) John E. Pellegrene.

The Goodyear Tire & Rubber Company (131) R. G. Abbott, E. Baxtresser, G. F. Ellis, H. S. Hansen, R. D. Inman, B. E. McClellan, H. J. Smith, H. R. Wickenden.

The Gorman-Rupp Company (1200) T. C. Bauck, James C. Gorman, Gilmore Hiett.

Gould-National Batteries, Inc. (346) Brown, Butler, Carver, Hart, Jordan, McCullough, Silver.

Griphoist, Inc. (1318) G. L. Robinson.

H & L Tooth Company (118) E. E. Drysdale, R. L. Launder.

Demonstrate Their Equipment For You

Hardinge Company, Inc. (614) R. L. Baldwin, R. C. Ferguson, Harlowe Hardinge, C. C. Nolan, R. J. Russell.

Harnischfeger Corp. (503) Harry Bartles, Jack F. Catalane, William Cheronos, William De Huff, Louis A. Flora, Henry Harnischfeger, Frank Hirner, N. E. Jones, Bernard Pratte, Karl Rathmann, Jerry Raubach, Patrick Shanahan, Jack Taylor.

Brad Harrison Co. (119) Kenneth Garrett, R. G. Gehlsen, W. B. Harrison Sr., W. B. Harrison Jr.

Herb J. Hawthorne, Inc. (1417) John W. Borrer, W. A. Davidson, L. L. Dinkins.

Hewitt-Robins Incorporated (1305, 1309, 1311, 1313, 1315, 1400, 1404, 1408, 1410, 1412, 1414) W. R. Needham.

The Frank G. Hough Co. (9) R. L. Beyerstedt, H. R. Brown, G. A. Gilbertson, J. C. Laegeler, R. G. Parsons, D. O. Ross, J. F. Yenney.

Hughes Tool Company (1008) Don Garrett, Roy M. Goolsby, Frank Potter, Leon B. Stinson.

Humphreys Engineering Co. (635) Robert Ennis, Thomas Ferree, Merrill Welker.

Industrial Nucleonics Corporation (1208) Ross Campbell, H. Hubinger, Bob Knapp, Merrill Luthman.

Industrial Physics and Electronics Co. (609) W. S. Hunter, C. M. Marquardt, G. E. Winslow.

Ingersoll-Rand Co. (506-510) F. Culbertson, T. Holmes, R. Macaul, M. L. McCormack, T. Slager, J. Stoddard.

International Harvester Company (435, 439, 534) R. G. Greer.

International Nickel Company, Inc. (1317-1319) G. H. Davis, K. A. DeLonge, W. R. Ferguson, J. C. Neemes, R. E. Savage, C. M. Schillmoller, A. G. Zima.

Isotopes Specialties Co. (709) Kenneth W. Newman.

The Jeffrey Mfg. Co. (1321) H. J. Flint, J. A. Flint, C. G. Hawley, R. W. Knodel, L. H. McReynolds, J. C. P. Taylor, J. E. M. Wilson.

Joy Manufacturing Company (200-300) H. E. Butters, D. C. Green, H. van Houten, R. E. Kinter, H. C. Nyquist, W. L. Wearly.

KW-Dart Truck Co. (425, 431, 524, 530) D. L. Bryan, W. C. Clayton, Jack H. Connors, L. E. Hyde, F. W. Walkup.

Kennametal Inc. (642) Edward J. Carroll, Edgar W. Engle, Donald C. McKenna, Philip M. McKenna, Duane S. Saxman, John P. Steel.

Krupp International, Inc. (45, 72, 74, 76) Heinrich Heep, W. Kamm, K. Loeffler, H. Petry, O. Wiesemann.

Lake Shore, Inc. (543) J. W. Clark, J. R. Greenly, B. W. Reeve, J. W. Tamar.

LeBus International Engineers, Inc. (1028) F. L. LeBus, Jr.

Le Roi Division, Westinghouse Air Brake Co. (21) Richard H. Koehler, Ralph B. Malsom, Robert L. McChain, Frank J. Zielsdorf.

Leschen Wire Rope Division, H. K. Por-

ter Co., Inc. (1504-1508) D. G. Berghund, J. K. Dilke, Gordon N. Dow, Karl F. Ewerhardt, R. Rex Hartup.

R. G. LeTourneau, Inc. (3, 5, 639) S. H. Fain.

LeTourneau-Westinghouse Co. (37, 39, 66, 68) Dan Burke, L. A. DePolis, D. K. Heiple, W. E. Hendricks, Ralph Kress, L. B. Philippi, L. A. Rager.

Libu Shovel Co. AB (36) Mike Clesham, Tage Leijon, Nils G. Mornestam.

Link-Belt Company (13, 215) Arthur H. Boike.

E. J. Longyear Co. (1212) Harry A. Kurtze.

Lubriplate Division, Fiske Brothers Refining Co. (247) H. E. van Bevers, R. Bick, J. Tiernen, R. L. Watts.

Machinery Center, Inc. (7) Donald O. Anderson, K. A. Lehner, J. C. O'Donnell, Paul C. O'Leary, Roger V. Pierce.

Mack Trucks, Inc. (17) A. G. Crockett, K. L. Fitts, C. E. Hallock, A. Rix.

Macwhyte Wire Rope Company (1518) F. E. Sime.

Frank J. Madison—Calco Supply Company (907) Frank J. Madison, B. B. Woodward, Jr.

Marion Power Shovel Company (1601) George Boulter, A. F. Busick, Jr., M. V. Cornell, L. C. Mosley, James Mullaney, D. B. Reed, Jr.

McNally Pittsburgh Mfg. Corp. (1217) Edward F. McNally, R. L. Pate.

Mine and Smelter Supply Co. (302) Donald J. Drinkwater, F. Robert Elsner, Elmer J. Garbella, Harry P. Kautz.

Mine Safety Appliances Company (1401) C. M. Donahue.

Mining World (1623) George O. Argall, Jr., John R. Bogert, Bob Chapman, Stanley H. Dayton, C. S. Denny, Norman C. Ek, Henry G. Grundstedt, Leo Lyons, Lynn Taylor.

Mission Manufacturing Company (130-132) Ted Fullinwider, M. C. King, Miller V. Sparks, E. C. Van Loozen.

Motoramic Inc. (1232) Kurt M. Holm.

Motorola Communications and Electronics Inc. (1419, 1616) Don Brickley, George Funky, Tommy Thompson, Dean Wilson.

National Chemsearch Corporation (707) S. Heller, L. A. Levy, James Stone.

National Iron Company (242) L. J. Carrier, Lewis C. Erickson, Gordon M. Mohr.

National Malleable and Steel Castings Co. (502) Arnold Shafer, H. H. Smith, M. W. Stevenson, J. F. Thomas.

National Mine Service Company (531) R. Park Lamborn, Gordon MacVean, T. James Montgomery, R. R. Schubert.

Nordberg Manufacturing Company (203) J. B. Bond, D. A. Cheyette, C. O. Friend, J. M. Friend, R. E. Friend, E. L. Satola, R. G. Schaaf, H. Zoerb.

Odgers Drilling, Inc. (906) M. A. Nelson, W. W. Svendsen.

Ohio Brass Company (626) J. H. Sanford.

Olin Mathieson Chemical Corporation (1613) L. F. Baity, D. E. Brow, D. J. C. Copps, M. E. Eilers, N. A. Hamilton, J. L. Miller, G. V. Mohatt, C. T. Straughan, J. L. Wetzel.

Pioneer Engineering Division, Poor & Co., Inc. (623) C. T. Hendrickson, Robert A. Johnson, Carl R. Rolf, W. H. Schannep.

Plymouth Locomotive Works Division of the Fate-Root-Heath Company (56) M. J. Fitch, T. F. Root, W. E. Root, D. B. Shaver.

Propellex Chemical Division, Chromalloy Corporation (811) R. A. Cooley, Alfred E. Pickard.

RKL Controls, Inc. (1107) R. K. Kichline, Geraldine C. Little, Robert K. Little.

Ramsey Engineering Company (1619) R. C. Cahill, Gar Kachel, H. N. Mahle, J. R. Riede.

Raybestos-Manhattan, Inc., Manhattan Rubber Division (243) A. Arguedas, J. P. Chilcote, R. B. Hazard, S. V. V. Hoffman, A. N. Johnston, Jr., T. W. R. Latham, R. B. Park, R. E. Stiles.

John A. Roebling's Sons Division, The Colorado Fuel and Iron Corporation (546) J. C. Barney, Earl A. Frazier, W. F. Hanline, George P. Hays, Walter A. Huber, William C. Kuhn, J. W. McClung, Albert Neroni, J. R. Randall, Douglas W. Vernon.

Sanford-Day Iron Works, Inc. (43) R. R. Durk, R. E. Jones, W. D. Moreman, George H. Shevlin, Ed Zink.

Schramm, Inc. (69) Robert P. Henry.

Smith Tool Company (1621) Hal Bentson, James A. Bouterse, John Henson, Art Marshall.

Spencer Chemical Company (1509) Charles M. Cooley, S. N. Gay, W. B. Macomber, Jr.

Standard Steel Corporation (239) Robert G. Boyles, Leo Briggs, Clay C. Hopper, Maynard C. Isheim, Webb L. Nimick.

Stearns Magnetic Products, Division of Indiana General Corp. (1216) W. J. Bronkala, D. F. Christnelly, F. S. Greenwald, R. W. Moore.

Stephens-Adamson Mfg. Co. (801) P. A. Christopher, William E. Cousland, R. E. Durham, R. H. Humm, D. L. Stephens.

Stoody Company (202-206) Donald A. Carlson, Kenneth G. Carter, Robert A. Hand, J. C. Messinger, George F. Staley, Marion Woods, Albert J. Zvanut.

E. E. Stookey-Farrell Cheek Steel Company (905) J. C. Farrell, F. A. Kingseed, E. E. Stookey.

Thor Power Tool Company (322) John F. Corkery, W. B. Hunn, B. H. Johns, W. A. Nugent.

The Timken Roller Bearing Company (318) F. M. Barry, G. T. Humphery, Jr., R. K. McConkey, W. E. McCoy, N. H. Peterson, P. J. Reeves, R. D. Turney, R. G. Wingerter.

Tool Steel Gear & Pinion Co. (1234) Leroy Brooks, Sanford Brooks, H. S. Mercier, James Roux.

Continued on page 109

"FLEXIBILITY AND LOW UPKEEP COSTS MAKE FLYGT PUMPS AN ADVANTAGE,"

reports LUCKY FRIDAY SILVER-LEAD MINES CO. Mullen, Idaho

While working a 750' shaft-deepening project from the 2300 to 3050 foot level, the Lucky Friday Mine ran into a dewatering problem which required pumping out an average of 150 to 175 gpm. At the start of sinking operations, air pumps were used, but because of periodic extra volume water seepage and excessive repair and maintenance costs, the air pumps were abandoned in favor of Flygt Model B-80L Electric Submersible Pumps.



In the pumping cycle, a Flygt Pump was lowered to the shaft bottom as soon after each blast as possible, and the water was lifted to relay pumps at a higher level, with heads up to 80 feet. The Mine Engineer, in a paper on the operation delivered before the Northwest Mining Convention, said of the Flygt pumping method: "Although the initial cost seemed high at first, the absence of expensive upkeep and the efficient pumping performance justified the investment. The quiet operation of the Flygt was a decided relief after listening to the siren-like air pumps. The Flygt Electric Pump was a distinct improvement over any type of air pump where large volumes of water had to be moved from the shaft bottom. It was low in upkeep cost and its unusual flexibility made it a definite advantage."

Since shaft sinking was completed, two Flygt Model B-80L Pumps now have become a part of the Lucky Friday's permanent mine pumping installation. In service since October 1956, they still are performing with a maximum of efficiency and a minimum of upkeep.

Additional satisfied users of Flygt Pumps in mining applications include Climax Molybdenum Mines in Colorado, Inspiration Copper Mine in Arizona, Kermac Nuclear Fuels in New Mexico, Boyles Bros. Drilling Co. in Utah, Utah Construction Co. in San Francisco, San Manuel Copper Mine in Arizona, White Cap Gold Mining Co. in Nevada, and others.

Flygt Electric, Submersible Pumps range from 1½" 85 gpm to 8" 3100 gpm capacity. Heads to 220'. Higher heads are possible with Flygt Pumps in tandem. Ask today for literature and an on-the-job demonstration.

CHECK THESE FLYGT FEATURES

- | | |
|-----------------------------------|-----------------------------|
| ✓ Electric | ✓ Heavy Duty |
| ✓ Resistant to Salt Water | ✓ Operates Unattended |
| ✓ Submersible | ✓ Runs Dry Without Damage |
| ✓ Easy to Handle | ✓ Quick and Easy to Service |
| ✓ Low Maintenance Costs | ✓ No Installation Costs |
| ✓ Will Pump High Amount of Solids | ✓ No Priming Needed |

WRITE FOR NAME OF YOUR NEAREST DEALER



FLYGT

PUMP BETTER ELECTRICALLY

— USE FLYGT —

WESTERN SALES & SERVICE

Stanco
MFGS. & SALES INC.

1666 Ninth St. (Corner of Olympic & Ninth)
Santa Monica, California



Metal & Mineral Prices

U.S.A.

METALS

September 23, 1960

COPPER: Electrolytic. Delivered F.o.b. cars, Valley basis (pound)	33.00¢
Lake. Delivered, destinations, USA	33.00¢
Foreign. Delivered, destinations, USA	33.00¢
LEAD: Common Grade. New York (Per pound)	12.00¢
Tri-State Concentrate, 80% lead, per ton	\$141.72
ZINC: Prime Western: F.o.b. E. St. Louis (Per pound)	13.00¢
Prime Western: Delivered New York	13.50¢
Tri-State Concentrate, 60% zinc per ton	\$80.00
ALUMINUM: Primary 50 Pound Ingots (99.5% plus) (Per pound)	26.00¢
ANTIMONY: Lone Star Brand. F.o.b. Laredo, in bulk (Per pound)	29.50¢
BISMUTH: (in ton lots) price per pound	\$2.25
CADMIUM: Sticks and bars, 1 to 5 ton lots Price per pound	\$1.50
COBALT: 97-99%, keg of 500 pounds (Price per pound)	\$1.50
COLUMBIUM: Ingot	Nom., per pound \$55.00-\$85.00
GERMANIUM: dioxide, high purity, gram	29.95-36.95¢
LITHIUM: 98% (per pound)	\$9.00-\$12.00
MAGNESIUM: Ingots (99.8%) F.o.b. Velasco, Texas per pound	36.00¢
MERCURY: Flasks. Small lots, New York	\$208.00-\$210.00
NICKEL: "F" Ingots (5 pounds), F.o.b. Port Colbourne, Ontario	75.50¢
PLUTONIUM: To July 1 1962 AEC will pay \$30.00 to \$40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram	\$30.00
SELENIUM: 99.5% per pound	\$7.00
TELLURIUM: Common grade, Per pound	\$4.00
THORIUM: per kilogram	\$43.00
TIN: Grade A Brands. New York (Per pound) Prompt delivery	\$102.00¢
TITANIUM: 99.3% + Grade A-1 Sponge (Per pound)	\$1.50-\$1.60
URANIUM: Rod (0.790 U-235) \$16.00 Per Pound; Foil	\$16.75
U-235: Nominal (Per pound)	\$7.725
GOLD: United States Treasury Price	\$35.00 per ounce
SILVER: Newly mined domestic. U.S. Treasury price per ounce	90.5¢
Foreign Handy Harmon	91.3¢
PLATINUM: Per ounce	\$82.00-\$85.00
ZIRCONIUM: Sponge, Per pound, Reactor Grade	\$5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: 10 to 12% BeO. F.o.b. mine, Colorado \$46.00 per unit	
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9% \$45; over 10.0% \$48.00.	
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons.	
African (Rhodesian). 48% Cr ₂ O ₃ . 3 to 1 Ratio	\$35.00-\$36.00
African (Transvaal). 48% Cr ₂ O ₃ . No ratio	\$26.00-\$28.00
Turkish, 48% Cr ₂ O ₃ . 3 to 1 chrome-iron ratio Nominal	\$36.00-\$37.00
U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.	
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal	\$1.10
IRON ORE: Lake Superior. Per gross ton Lower Lake Ports	
Mesabi, Non Bessemer, 51.5% Fe	\$11.45
Mesabi, Bessemer, 51.5% Fe	\$11.60
Old Range Non Bessemer	\$11.70
Old Range Bessemer	\$11.85
Lump: Plus ½-inch	\$12.85
Fines: Minus ½-inch	\$10.72
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit	24.00-25.0¢
MANGANESE ORE: Metallurgical grade, 48 to 50% Mn Long ton unit	\$0.95-\$1.00
Metallurgical grade, 46 to 48% Mn. Long ton unit	\$0.90-\$0.95
Metallurgical grade, 44 to 45% Mn. Long ton unit	\$0.85-\$0.90
Domestic U.S. Government, GSA Basis \$2.30 per unit for 48% Mn.	
MOLYBDENITE ORE: 90% MoS ₂ F.o.b. Climax, Colorado. Per pound 45¢, plus container cost	\$1.25
TUNGSTEN CONCENTRATE: Domestic, 60% WO ₃ Per short ton unit	Nominal \$24.00
Foreign: 65% WO ₃ Per short ton unit (Scheelite)	Nominal \$20.25
Foreign: South American, Spanish, Portuguese	Nominal \$20.00
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U ₃ O ₈ in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.	

NON-METALLIC MINERALS

BARITE: Oil well drilling. Minimum 4.25 specific gravity, per short ton	\$16.00
BENTONITES: Minus-200mesh. F.o.b. Wyoming. Per ton, carload lots	\$12.50
Oil Well grade. Packed in 100 pound paper bags	\$14.00
BORON: technical grade .. F.o.b. Boron California. Per ton	\$47.50
FLUORSPAR: Metallurgical grade. 72.5% effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines	\$37.00-\$41.00
Mexican, 70% F.o.b. border	\$28.00-\$29.00
3d Grade, 97% CaF ₂ Bulk, F.o.b. mine	\$45.00-\$49.00
PERLITE: Crude: F.o.b. mine per short ton	\$3.00 to \$5.00
Plaster grades. Crushed and sized, F.o.b. plants	\$7.00 to \$9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas	\$22.50-\$23.50

London

September 23, 1960

	Per Long Ton	USA Equivalent	cents per pound
COPPER: Electrolytic spot	£236	15s 0d	29.59¢
Refined, 99%	£ 70	0s 0d	8.75¢
ZINC: Virgin 98%	£ 86	17s 6d	10.86¢
ALUMINUM: Ingot, 99.5%	£186	0s 0d	23.25¢
ANTIMONY: Regulus, 99.6%	£197	10s 0d	24.69¢
TIN: Standard, 99.75%	£ 80s	0s 0d	100.63¢
TUNGSTEN: Long ton unit	£159s	0s 0d	\$22.40¢

*With Sterling Pound at \$ 2.80

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N. Y.

PROOF (from Anaconda)

that a
Ni-Hard Mill Liner
is good to the
last 1/4 inch

You've heard it said many times..."A Ni-Hard Mill Liner is good to the last 1/4-inch!"

Well here's photographic proof; from the Montana mines of The Anaconda Company, where the long life and outstanding performance of Ni-Hard* nickel-chromium-iron alloy liners have saved many thousands of hours of downtime. And done wonders for tonnage too — in both ball mills and rod mills, at the feed end as well as the discharge end.

This "good-to-the-last-1/4-inch" performance of Ni-Hard mill liners can do wonders for your tonnage. For if ever there was a service where superior abrasion-resistance coupled with a uniform wear-rate really counts, it's in mill liners. Try a set of Ni-Hard liners in your mills and see for yourself.

Ni-Hard iron's superior abrasion-resistance and uniform wear-rate also count heavily in prolonging the life of feed spouts, pipe elbows, slurry pump liners and impellers, dust-collector cyclones, chute liners and many other parts for ore-processing equipment.

Our detailed, 58-page booklet, "Engineering Properties and Applications of Ni-Hard" suggests many ways to put versatile, long-wearing Ni-Hard to work profitably. Say the word and we'll be glad to send you a copy.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street  New York 5, N. Y.



NI-HARD®

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

**toughest
portable
power
cables
made!**

SUPER SERVICE

Where the going is rough, men who know mining have proven that General Cable's complete line of Super Service Portable Power Cables are built better to last longer than any other. From many years of field experience, General Cable has engineered each construction from conductor to jacket to stand up to the most rigorous service conditions. The Supertuf jacket is extra tough, extra tear resistant, exceptionally resistant to

abrasion and outstandingly resistant to oil, acid, water, flame and sunlight.

Stocks of Super Service cables are maintained at a General Cable distributing center handy to your location. The brochure showing the basic types and sizes may be obtained at any of the 65 General Cable Distributing Centers.

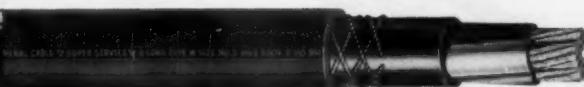




FLAT TWIN for use on shuttle cars, cutting machines, loaders, drilling units and other d-c equipment.



TYPES W and G for heavy-duty mobile equipment and d-c and a-c mining machines.



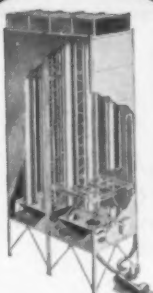
SH-D SHOVEL CABLE for high voltage supply with maximum safety to shovels, dredges, cranes and draglines.



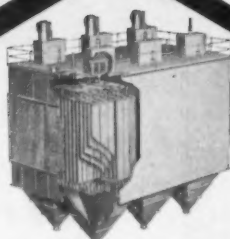
GENERAL CABLE CORPORATION, 730 Third Avenue, New York 17, N. Y.
Offices and Distributing Centers Coast-to-Coast

for quality
and service
specify...

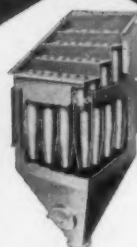
GENERAL CABLE



**JET-CLEANED
FILTER**
("Dualaire")



PRECIPITATOR
("Cottrell" Electrostatic)



CYCLONE
("Multiclone" Collector)

In Air Pollution Control...
There's Only 1
With All 2!



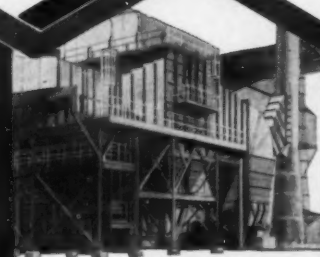
HI-TEMP FILTER
("Therm-O-Flex")



JET-WHIRL SCRUBBER
("Joy Microdyne")



DEEP-BATH SCRUBBER
("Turbulaire-Doyle")



COMBINATION
("Cottrell-Multiclone" CMP)

HOW WESTERN PRECIPITATION'S UNIQUE "KNOW-HOW" BENEFITS YOU!

The science of dust, fume and fly ash recovery is a highly technical one. Moreover, the fact that there are a number of basic methods for separating suspensions from industrial gas streams — each with certain advantages and disadvantages — further complicates the basic problem.

Even two different plants cleaning the same type of gas may find that such variables as capital investment policies, maintenance and labor schedules, and other similar management functions may make one type of equipment the logical choice for one plant — a basically different type of equipment the best solution for the other.

That's why Western Precipitation's position in the gas cleaning field is so unique. It is the *only* organization that

designs, engineers and installs *all* the basic types of gas-cleaning equipment. It is completely unbiased in its viewpoint, and is able to show you exactly how the overall costs, the collection efficiencies and the operating requirements will vary for each installation — with each type of collecting equipment that may be applicable.

Such an unbiased evaluation is invaluable in assuring optimum returns from your gas-cleaning dollar. Best of all, this unique "know-how" costs you nothing. It is a basic part of Western Precipitation's service to industry throughout the United States, Canada and the Free World.

Our nearest representative will gladly place this unique fund of experience at your service. Why not call him today?












WESTERN PRECIPITATION

DIVISION OF JOY MANUFACTURING COMPANY

1000 WEST 9TH STREET LOS ANGELES 54, CALIFORNIA
NEW YORK 17 • CHICAGO 2 • PITTSBURGH 22 • ATLANTA 5 • SAN FRANCISCO 4
IN CANADA: 8285 MOUNTAIN SIGHTS AVENUE, MONTREAL, P. Q.

G-190

								
Cottrell Precipitators	Multiclone Dust Collectors	Therm-O-Flex Hi-Temp Filters	Dualaire Reverse-Jet Filters	Turbulaire-Doyle Scrubbers	Joy Microdyne Scrubbers	Combination Units	Holo-Flite Processors	Hi-Turbiant Heaters

MEN who make the news in the U. S. A.



RUSS WOOD



P. W. ZILLIACUS



G. H. BRYANT



R. E. SHREVE



C. E. SCHWAB



R. F. BROOKS

Russ Wood, former manager of mining operations of Standard Uranium Corporation in Silverton, Colorado, has been promoted to manager of mines of the company. In his new position, Mr. Wood will be in charge of the Big Buck uranium mine at Moab, Utah, the Shenandoah Dives mine at Silverton, and the Micawber mine at Crested Butte, Colorado.

Patrick W. Zilliacus has been named general sales manager of the Western Precipitation Division of Joy Manufacturing Company of Los Angeles, California. Mr. Zilliacus, who had been manager of agency sales for the division, has been associated with Joy since 1956.

Roy Coulson, superintendent of Vitro Minerals Corporation of Riverton, Wyoming, has been elected president of the Wyoming Mining Association. He succeeds **Myron L. Sisson** of Colorado Fuel & Iron Corporation at Sunrise.

M. E. Johnson and **N. G. Helland** have been appointed managers of operations in charge of mines and plants for the Oliver Iron Mining Division of United States Steel Corporation at Duluth, Minnesota. Mr. Johnson had been assistant general superintendent of the former western district, and Mr. Helland was district superintendent of the division's operations in the Hibbing-Chisholm area. Named in other personnel shifts within the organization were **M. R. Sermon**, new superintendent of mining engineering for Minnesota operations; **R. R. Wallace**, new assistant superintendent of mining engineering; **R. W. Segar**, newly appointed superintendent of industrial engineering; **J. B. Sundquist** and **J. R. Aho**, new industrial engineering supervisors, and **Bruno Scipioni**, assistant to manager of mining engineering.

Joseph T. Hall, president of Callahan Mining Corporation of New York, has been appointed to the Bunker Hill Company board of directors.

Grant Nielsen has been appointed president of Ranrex Oil and Mining Company, succeeding the late **Harvey R. Feller**. Other company officers include **Dale Simpson**, vice president; **Blyth Gardner**, secretary, and **Richard G. Allen**, general manager.

Donald J. Cook has been appointed acting head of the department of mining and metallurgy at the University of Alaska for the 1960-1961 term. **Earl Beistline**, dean of the school of mines, has accepted temporary appointment as dean of the faculty at the university.

G. H. Bryant, former mill superintendent of the Riverton, Wyoming facilities of Susquehanna-Western, Inc. and Mines Development, Inc., has been appointed manager of the firm's metallurgical division. Succeeding Mr. Bryant as the Riverton mill superintendent is **Richard E. Shreve**, superintendent of the Gunnison Mining Company's uranium mill in Colorado for the past two years.

Steven Clark, University of Minnesota; **Terry Turner**, Missouri School of Mines; **William Seery**, Colorado School of Mines; **Joseph Conway**, Pennsylvania State University; **Richard White**, Michigan College of Mining and Technology, and **Martin Merz**, Stanford University, have been named winners of the first Louis Ware senior-year \$1,000 scholarships to students at leading mining colleges. The awards program, sponsored by International Minerals and Chemical Corporation of Skokie, Illinois, was announced last year, and named in honor of Mr. Ware, who had been president of the company for 20 years. The scholarship program includes awards to six students of leading agricultural colleges.

E. W. Claar, former manager of the Eastern Clay department of International Minerals and Chemical Corporation, has been appointed general sales manager of the firm's industrial minerals division. Other men reappointed in the reorganization, which merged the Eastern Clay and Consolidated Feldspar divisions of the company, are **C. P. Loucks**, general production manager; **T. E. Barlow**, foundry sales manager; **E. W. Koenig**, ceramic sales manager; **W. K. Burris**, field sales manager; **P. Blazovic**, production manager of feldspar; **R. N. Davidson**, production manager of clay, and **R. J. Menze**, staff manager of production planning.

John H. Torreano has been appointed superintendent of Republic Steel Corporation's Tobin iron mine at Crystal Falls, Michigan. He succeeds **Edwin H. Anderson**, who has retired after more than 40 years service with the company. Mr. Torreano joined Republic in 1940, and has been mining engineer at Tobin since 1943.

A. G. Moore, manager of mining for Gladding, McBean & Company of Los Angeles, California, has been appointed director of the company's mining and raw material development division. Mr. Moore, who has been with the firm since 1952, will be responsible for exploration, development and mining of all raw material resources.

Charles E. Schwab has been appointed president and chief executive officer of The Bunker Hill Company, filling the position left vacant by the death last November of **John D. Bradley**. Mr. Schwab, who has been associated with Bunker Hill since 1944, has served as the company's general manager of the Kellogg, Idaho, operations since January, and was named a vice president April 1.

Richard F. Brooks, former director of mining and raw material development of Gladding, McBean & Company, has been elected vice president of Desert Minerals, Inc., and its affiliate, American Mineral Company of Los Angeles, California.

Kenneth Nobs, former mine superintendent of Hidden Splendor Mining in Gas Hills, Wyoming, is now associated with Western Nuclear Corporation at Jeffery City, Wyoming.

Dr. Walter C. Hahn, Jr., has joined the faculty at Montana School of Mines as assistant professor of metallurgy. Dr. Hahn was formerly associated with the Sylvania Electric Company at Bayside, New York and the Olin Mathieson Chemical Company at New Haven, Connecticut.

James V. Kelly has been appointed geologist for the Chicago, Milwaukee, St. Paul and Pacific Railroad Company. He maintains headquarters in Chicago, Illinois.

Dr. John R. Hayes has been promoted to full professor of geology at the Colorado School of Mines at Golden. Other men promoted were **Dr. Frank S. Mathews**, associate professor of physics; **Dr. Robert J. Weimer**, associate professor of geology, and **Hildreth Frost, Jr.**, assistant professor of metallurgy.

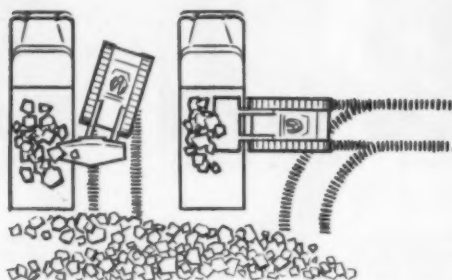
Harold A. Griffin has been named new assistant superintendent of the milling department of Tennessee Copper Company. Until his appointment, Mr. Griffin was general foreman of the company's Isabella acid plant.

William A. C. Eldon has been named operations manager of Foote Mineral Company's Cold River, New Hampshire plant. He replaces **William R. Hudspeth, Jr.**, who has been named special projects manager of the company's marketing department in Philadelphia. Mr. Eldon has been with the company since 1950 and has served at the Exton, Pennsylvania and Kings Mountain, North Carolina plants in an engineering capacity.

LIBU[®] THREE-WAY DUMP BUCKET CUTS LOADING COSTS

LIBU

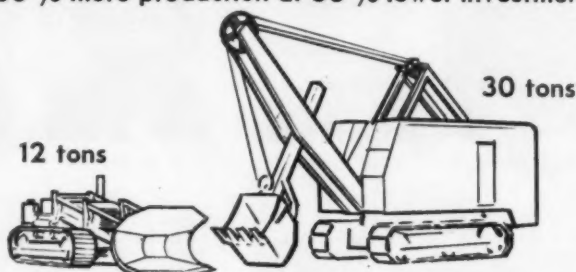
CONVENTIONAL BUCKET



Faster digging, shorter driving distance, less turning saves: Labour costs – wear of tracks and wheels – fuel and engine.

AVERAGE COST REDUCTION 20 – 60 % PER TON

LIBU METHOD GIVES 80 % more production at 30 % lower investment



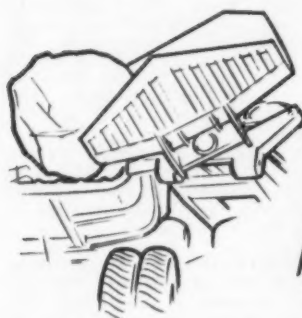
180 cu.yds/hour

LIBU 2700 + Cat 955 weighs only 7 tons per 100 cu.yds capacity. No bulldozer needed.

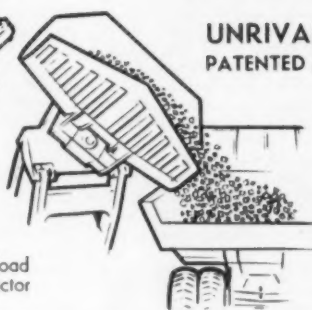
100 cu.yds/hour

1 cu.yd shovel weighs 30 tons per 100 cu.yds capacity. Bulldozer needed for scraping and cleaning.

LIBU[®] V-SHAPED BUCKET



UNRIVALLED DIGGING
PATENTED ALL OVER THE WORLD



Does not damage the trucks – will load any kind or shape of rock the tractor can lift.

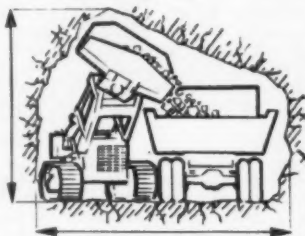


RELIABLE –

1000,000 tons of copper ore loaded last year at St. Patrick's Copper Mines, Avoca, Ireland.

THE ONLY THREE-WAY DUMP BUCKET – A NECESSITY WHERE SPACE IS SCARCE

LIBU on Cat. No.	Minimum space (inches)	
	Height	Width
977 [®]	178"	233"
955	157"	216"
933	142"	205"
944	178"	233"



SOLD BY CATERPILLAR[®] DEALERS ALL OVER THE WORLD

CHARACTERISTIC SITES WITH

LIBU

Limestone

Sté Ciments d'Origny, France
Paraisten Kalkkivuori Oy, Finland
Bündner Zementwerke AG, Switzerland

Road construction

Impresit, (Milano) Iran
Richard Costain Ltd (London), Nigeria
Sté des Grands Travaux de Marseille, France

J.M. Newcombe Bond, South Africa

Hydroelectric power stations

Royal Board of Waterfalls, Sweden
Italstrade S.p.A., Italy

Slag

Socol, Cockerill-Ougrée, Belgium
Klöckner Hütten AG, Bremen, Germany

Mines

St. Patrick's Copper Mines, Avoca, Ireland
Barbara Erzbergbau, Bückeburg, Germany
Otanmäki Oy Iron ore Mines, Finland
Sydvaranger Iron Ore Mines, Norway

Tunnels

Messrs. A.A. Stuart, Kilmorack, Scotland
State Railways of Norway
Karke Oy, Heinola, Finland
Mayreder & Kraus, Linz, Austria

LIBU[®]

SHOVEL CO AB

Address: Sturevägen 18
STOCKSUND Sweden

Affiliated companies: New York, Los Angeles (U.S.)
Amersham (England), Sydney (Australia)

WHAT'S GOING ON in mining

Ambrosia Lake Milling, Mining Costs Revealed

Mining and milling costs for the last fiscal year as well as most recently computed reserves of the Homestake-Sapin and Lance Corporation properties in Ambrosia Lake, New Mexico, have been released by Sabre-Pinion Corporation.

Reserves, which are expected to be substantially increased with additional drilling this year, are 5,804,535 tons of approximately 0.216 percent U_3O_8 , totaling 21,240,500 recoverable pounds of U_3O_8 , having a gross value of \$8.00 per pound.

During the year ended June 30, the Homestake-Sapin mill operated at the rate of 1,500 tons per day, slightly in excess of rated capacity. Milling costs have been lowered from an average of \$6.80 for the 12 months ended March 31, 1959, to \$5.72 per ton for the year ended this June 30. Tons of ore processed in that period totalled 617,840 tons, average grade of U_3O_8 was 0.177 percent, pounds of U_3O_8 produced was 2,004,329, with 91.30 percent recovery. Slightly better than 93 percent recovery is anticipated for the coming year, with consequent improved income for the partnership.

Mining costs for the six months ended June 30 were higher for the Homestake-Sapin properties because there was less tonnage mined since the Lance mines came into production during this period. Costs for Section 15 were \$6.76 per ton for 206,647 tons mined; for Section 23, \$10.28 for 183,469 tons, and for Section 25, \$21.84 for 72,550 tons mined, to make an average cost of \$10.52 per ton for a total tonnage of 462,666.

Wetness of the Homestake-Sapin properties has decreased profits but continued improvement is expected this year as the amount of water is reduced. In March of this year Section 23 mine was producing 502 gallons of water per minute, but by June this was reduced to 350, while in the Section 25 mine, 1,721 gallons of water per minute produced in March decreased to 1,175 gallons per minute in June.

In the Lance-Homestake venture tons of ore mined during the 12 months ended June 30 totalled 134,955, at an average cost per ton of \$8.89. Of this amount, the Section 12 mine, where development work was completed last December, produced 112,474 tons, and the Section 18 mine, where development work was finished in April, had an output of 22,481 tons.

Bear Creek Seeks Copper In Snohomish Co., Washington

Bear Creek Mining Company, exploration subsidiary of Kennecott Copper Corporation, has been carrying on extensive geological exploration work in and around Snohomish County, Washington, this summer.

Exploration crews are getting geological information from old mines and also working in new areas. Work has been done in the Sultan Basin, Index mine area, Miller River, Silver Creek, Monte Cristo, and on the north fork of the Snoqualmie River mining district.

In Sultan Basin there are two or three known large breccia pipes and breccia

zones which contain very extensive low grade copper mineralization. The old Index mine has a recorded production of about 200,000 tons of 5.0 percent copper ore.

One of the companies active in the area in the past was Index Gold Mines, Inc., which in 1939 produced about 10 tons of ore daily from the mine in the Cascade Mountains. Values were in gold, silver, lead, zinc, and arsenic. Granore Mines Ltd., a subsidiary of Granby Consolidated Mining, Smelting & Power Co. Ltd. of Canada, explored the Index property in 1955 under a leasing arrangement. Granore also prospected the old Sunset Mining Company property on the north fork of the Skykomish River in 1955.

Climax Molybdenum Plans Shaft and Exploration Drift

Climax Molybdenum Company will construct a shaft headframe and hoisting plant in the Storke Level yard in preparation for sinking a vertical service shaft to its new production level. Actual shaft sinking at the Climax, Colorado, opera-

tion will begin next year. J. A. Park Machinery Company of Pueblo, Colorado has the contract for the construction.

The service shaft to the new level 300 feet below Storke will be 23 feet, four inches in diameter, concrete-lined, and 640 feet deep. Preparatory work includes relocation of roads and driving of a personnel tunnel from the present dry and locker building to the area of the shaft collar.

During shaft sinking development rock will be transported through the personnel tunnel, which later will provide all-weather access to the shaft collar. The shaft will be collared with a metal caisson lining for about 30 feet. The headframe will then be erected over the collar and the hoisting plant built.

Climax is also getting ready to drive an exploration drift under Ceresco Ridge in order to provide diamond drill stations from which the mineralization pattern under the ridge can be investigated. To prepare for the drift, an overpass is being built at the Thorpe Avenue-Arkansas Street intersection so that traffic will cross over tracks to be used by ore trains in removing developmental rock from the exploration drift.



Reserve Expanding Taconite Production

Major projects in the \$120,000,000 expansion of Reserve Mining Company's taconite mill at Silver Bay, Minnesota, are shown in this aerial photograph. Key points in the program show location of (1) ore car dumper building where a second dumping mechanism will be installed; (2) crushing plant which will have five additional second and third stage lines; (3) concentrating mill where eight additional lines will extend to the east; (4) powerhouse, where another boiler and generator will be added; (5) pelletizing area where a second plant to the east will house two new 225-foot-long machines fed by six storage bins, six balling drums, and associated equipment; (6) shop area to be enlarged by a 100-foot extension, and (7) pellet storage, where capacity will be increased by extending bridge runways, conveyors, and storage yard to the west for about 900 feet, and additional conveyors will be installed from the pellet reclaiming hoppers. Reserve will also construct a second coarse crushing plant at Babbitt and build a second track alongside the present 47-mile railroad used to transport the crude ore mined at Babbitt to the mill at Silver Bay. The company also plans to invest additional millions in expansion and development of the two taconite-built towns that will require additional homes and shopping facilities. The project will increase Reserve's taconite producing capacity by about 50 percent for a total yearly output of 9,000,000 tons. About 1,800 construction workers will be employed in the program which will raise employment at Reserve from about 2,200 to 3,000.

WHAT'S GOING ON...

CENTRAL AND EASTERN

Humboldt Starts 650,000 Annual Ton Pellet Plant

Humboldt Mining Company's new pelletizing plant and expanded flotation mill at Humboldt, Michigan are now in full operation. Cleveland-Cliffs Iron Company manages and supplies technical supervision to the jointly owned Cliffs-Ford Motor Company mining subsidiary.

The initial flotation plant at Humboldt started operation in 1954 to mill specular hematite (jaspellite) of the Marquette Range with a capacity to produce 325,000 annual tons of flotation concentrate. This concentrate was then shipped to Lower Lake steel mills and sintered. The new plant incorporates all the technical knowledge learned from operating the first unit so that operations are more efficient and lower in cost.

Ore, about 33 percent iron, is mined by open pitting, crushed in three stages, ground in rod and ball mills, and floated with fatty acids to produce a 62 percent iron concentrate. This concentrate is then balled into minus- $\frac{1}{8}$ -inch pellets which are fired by the grate-kiln system designed and built by Allis-Chalmers Manufacturing Company. This is the world's first commercial application of this system for iron flotation concentrates.

Walter A. Sterling, Cliffs' chairman and chief executive officer, and Irving A. Duffy, Ford vice president, officially dedicated the new plant on September 16.

National Clay Conference At Purdue October 5-8

Two symposia, a discussion on clay mineral nomenclature, laboratory visits and a field trip are highlights of the program for the Ninth National Clay Conference being held October 5 through 8

in Lafayette, Indiana. The conference, sponsored by the Clay Minerals Committee of the National Academy of Sciences-National Research Council, is at the Memorial Center of Purdue University. All those interested in research or technology in fields related to clays or clay minerals are invited to participate.

"Engineering Aspects of Physico-Chemical Properties of Clays" is the subject of the first symposium, to be held Thursday morning and afternoon October 6, while "Clay-Organic Complexes" is the theme for the one Saturday morning and afternoon. The nomenclature discussion is scheduled for the opening evening session at 7:30 Wednesday.

General sessions are being held Thursday evening and Friday morning and afternoon. The laboratory visits are planned for Wednesday morning after registration, while the field trip takes place at 1 p.m. that day.

Central

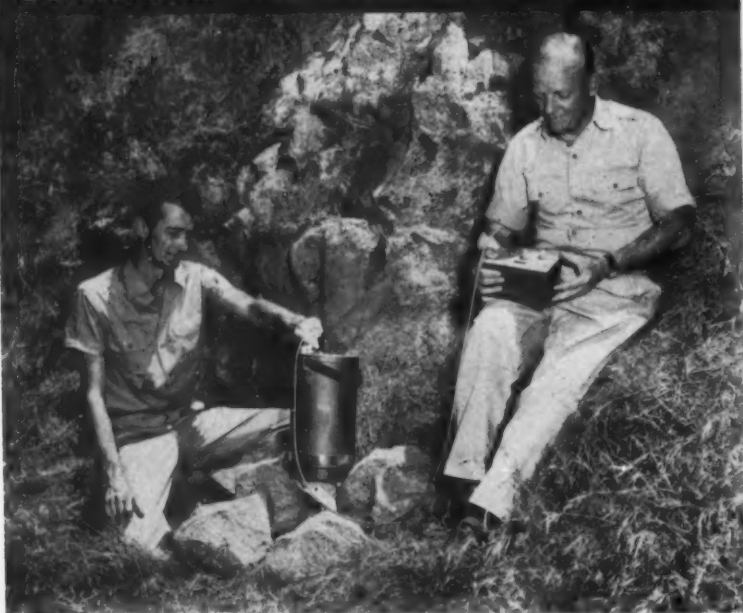
National Silica Company has started operations in its new \$500,000 silica plant near Guion in Izard County, Arkansas. While the plant was still under construction the company announced plans for two more plants, one that will produce silicon and another, to cost about \$2,000,000 for manufacture of silicones for the electrical industry. The Arkansas plant is on an 800-acre site that contains a large deposit of silica. The ore is 99.3 percent SiO_2 and is the white St. Peters silica rock. The plant has a capacity of 120 tons an hour. Both underground and open pitting will be used to mine the silica from deposits 75 to 165 feet thick. For stripping in the last six months a stream of water under 125-pound pressure at the rate of 5,000 gallons an hour was used to wash off the overburden.

Completion well ahead of schedule is expected by Missouri Pacific Railroad Company for the 26-mile line it is building to the Pea Ridge iron mine project in Missouri. Last spike of the line, begun in April at Cadet, Missouri, was driven in July. Remaining work on the project includes laying a mile and a half spur from the Pea Ridge line to the St. Joseph Lead Company Indian Creek plant. Scheduled for completion in January, the project will probably be finished early this fall. Runaround tracks within the Pea Ridge yard will be built by Meramec Mining Company. Original estimated cost for the railroad project was \$3,500,000.

An outstanding safety record from September 29, 1958 to March 17, 1960 brought two awards recently to the Iron Mountain mine of Midwest Ore Company in Missouri. During this period there were no lost time accidents at the mine. Employees received a certificate of achievement in safety from the U.S. Bureau of Mines and an award of honor from the National Safety Council. In the 1959 national safety competition, the mine placed third in the metal mining division.

St. Joseph Lead Company is using 30-ton capacity Cline Diesel trucks for hauling ore from shafts to the mill at the company's Viburnum, Missouri, operation. Special permits were required for moving this oversize equipment on public highways to Viburnum where private roadways are used.

BERYLLIUM ORE DETECTION MADE EASY



with
ISOTOPES'
new
"Beryllometer"®

A new detection machine is now available to prospectors of Beryllium ore. The "Beryllometer" can be used directly on outcroppings, boulders, and any other likely looking rock formations. Eliminates the old fashion time consuming method of chemical analysis.

"Beryllometer" is portable, safe and self-powered and makes an efficient means of field analysis. Write for complete specifications and prices.

Booth 709 Mining Show, Las Vegas



ISOTOPES SPECIALTIES COMPANY

Division of Nuclear Corporation of America
BOX 688 • BURBANK, CALIFORNIA

Miners to Study Safety In Chicago Oct. 17-20

Election of officers will start proceedings at this year's Mining Section session of the National Safety Council Congress being held October 17 through 20 in the Morrison Hotel, Chicago.

Speakers on the program that afternoon include Peter Stym of Gaspe Copper Mines Ltd.; Carrol J. La Duc of Jones & Laughlin Steel Corporation; and H. C. Bent of Noranda Mines Ltd.

At a joint luncheon with delegates from the Cement, Quarry and Mineral Aggregates, and Coal Mining Sections, the speaker will be J. R. Kringel of New York Trap Rock Corporation, whose subject is "Production Management Looks at Safety." Later the Mining Section will be addressed by Marvin Johnson, Oliver Mining Division, United States Steel Corporation, and A. C. Blackman of the American Society of Safety Engineers.

Speakers on Wednesday and Thursday afternoons include Vernon F. Bishop, Union Carbide Nuclear Company; Brian F. Burt, American Chrome Company, Herbert A. Wendel, The Anaconda Company, and James F. Doyle, M. A. Hanna Company.

Eastern

Production at the Grasselli zinc mine of American Zinc Company of Tennessee was stopped late this summer. The mine at New Market, Tennessee was reopened last January and has been producing about 350 tons of lead-free zinc ore per day. Approximately 30 men were employed at the mine. Development of ore bodies will continue indefinitely.

The new superphosphate plant of Virginia-Carolina Chemical Corporation in Nichols, Florida, was named in honor of the company's executive vice-president, Charles Tayloe Harding, who began his career with the firm as a handy man 42 years ago. Mr. Harding was honored during the recent dedication of the plant. The Nichols project, part of a \$12,000,000 expansion program for the chemical company, will increase the firm's triple superphosphate capacity from 100,000 tons to 300,000 tons per year. Virginia-Carolina is also building a \$1,000,000 plant to produce 100,000 tons per year of diammonium phosphate.

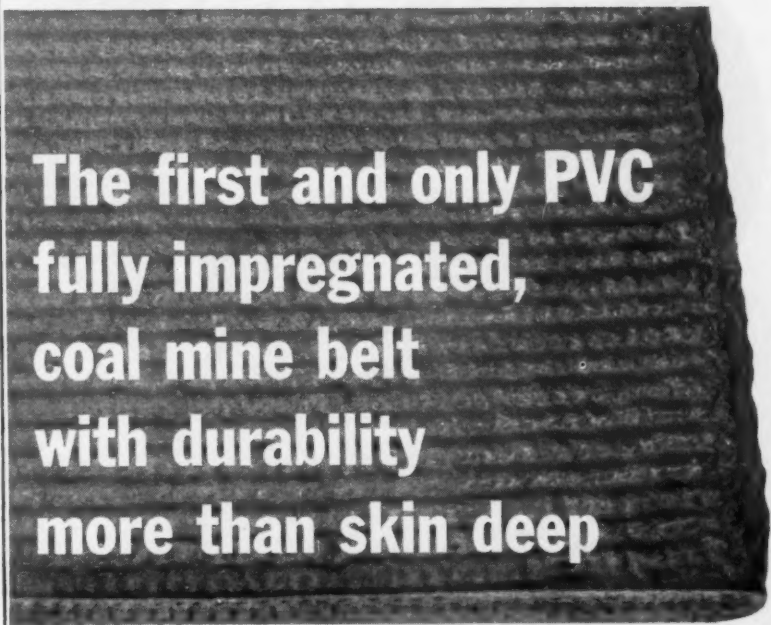
Production of phosphoric acid by Swift & Co. near Bartow, Florida will be doubled with construction of a new plant to be started this fall. Swift & Co., which has mined phosphate ore in the Bartow and Fort Meade areas for several years, has a triple superphosphate plant in connection with its mining operation and the new facilities will permit increased output of that product.

The J. Willis Crider Company at Mexico and the Marion Mining Company near Hebron, Kentucky, are mining barite from open pit.

A multi-million dollar program to be started immediately by American Cyanamid Company will double production of wet-process phosphoric acid at the company's Brewster, Florida plant. Earlier the company had begun a 25 percent expansion of facilities. When the new program is completed the plant will have



INTRODUCES REVOLUTIONARY "PLASTICOAL"



The first and only PVC
fully impregnated,
coal mine belt
with durability
more than skin deep

All the disadvantages of short life, slippage, stretching and rotting of conventional light-weight coal mine belts have been overcome by the revolutionary Thermoid-Quaker "Plasticoal" belt.

In contrast to conventional double-woven cotton fabric covered with neoprene, new "Plasticoal" is impregnated through and through with Polyvinyl Chloride . . . even the yarn is PVC dipped before it is woven. Nylon cords are added, in both directions, to provide extra strength and the entire impregnated carcass is heat-set under tension before the final dip and heat-set.

For underground mine safety, USBM 28-11 "Plasticoal" is flame retardant and flame resistant. It's lighter in weight and more flexible for ease of handling underground. The rough surfaces give better material traction, less slippage, yet require less tension. And being completely impregnated with PVC, the "Plasticoal" carcass carries the load long after the cover is worn away. Even extreme edge wear will not put "Plasticoal" out of commission.

Mine-orange "Plasticoal" is available from stock in 26", 30" and 36" widths, up to 600' lengths or longer on request. See your Thermoid Division Distributor for all the advantages of new "Plasticoal." Or write Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.

THERMOID DIVISION

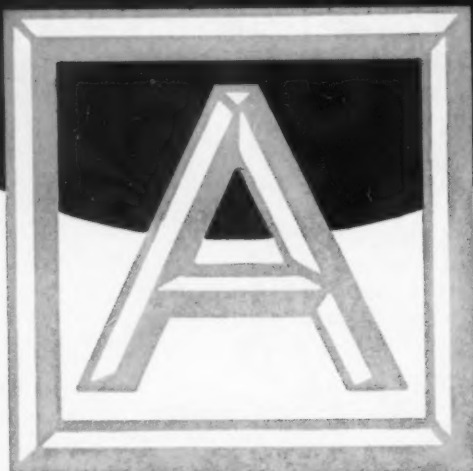
PORTER

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

More Honors

FOR THE BIG



First source for...



Steel Castings

GOOD NEWS for the Western Metal Industry. Now Alloy Steel & Metals Co. can supply you with castings made from "T-1" Steel. Plate and bar stocks of this remarkable constructional alloy steel have been in use for several years, now it is available for the first time for castings. Its casting characteristics allow designers to take advantage of the physical properties without "over-design".

Alloy Steel & Metals Co. was selected as the first foundry to be licensed because of its outstanding performance in producing castings for defense projects.



"T-1" is a registered trademark of United States Steel.

ALLOY STEEL & METALS CO.

1848 E. 55TH ST. • LOS ANGELES 58, CALIF. • Phone LUdlow 3-3471
Mailing Address: BOX 58323 VERNON STATION, LOS ANGELES 58

Outstanding Advantages of "T-1" Alloy Steel Castings:

- A proven engineering material.
- Over 3 times the yield strength of structural carbon steel.
- Weldable without preheating or post-heating.
- Exceptional toughness, even at subzero temperatures.
- Outstanding resistance to the combination of impact abuse and abrasion.
- Reduces ultimate costs.
- Reduces weight safely—as much as 25% to 50%.
- Outstanding for meeting ASTM Specifications A 148 and A 352.

For complete information on "T-1" constructional alloy steel castings, send for new Engineering Bulletin No. 300-A2.

WHAT'S GOING ON... CENTRAL AND EASTERN

a capacity of 400,000 tons of wet-process 54 percent phosphoric acid annually. The new construction will also provide an increased tonnage of triple superphosphate. According to Wilbur G. Malcolm, president, the use of fertilizer in which his company's products are used has tripled within the last 15 years and is expected to double or triple again in the coming 25 years.

Iron Ranges

Mining operations of **The Pacific Isle Mining Company** the past season have been conducted on a number of properties extending from Aurora to Mountain Iron on the Mesabi Range. At Aurora is the **Meadow** mine, an underground operation later converted to an open pit. Pacific Isle also operates the **Wyoming** open pit mine at Virginia, which is a leasehold of the **Pittsburgh Pacific Company**. Several other properties—the **Iroquois**, **Wacoutach** and the south half of the **Missabe Mountain** property—are also producing iron ore for Pacific Isle.

Construction work on the new **Sherman** concentrator for **Oliver Iron Mining Division, United States Steel Corporation**, continues, with steelwork being erected by **American Bridge Company**. The five-story high beneficiation plant at Chisholm, Minnesota is being erected adjacent to the present **Sherman** re-screening plant. Operation is scheduled for next spring. The concentrator will treat low-grade ore produced from the **Monroe** and **Sherman** groups of mines.

An important mechanical transition carried out by **Reserve Mining Company** at its Silver Bay, Minnesota taconite concentrator involved lengthening of all rod and ball mills to increase capacity. The concentrator has 12 units, with a rod and a ball mill in each.

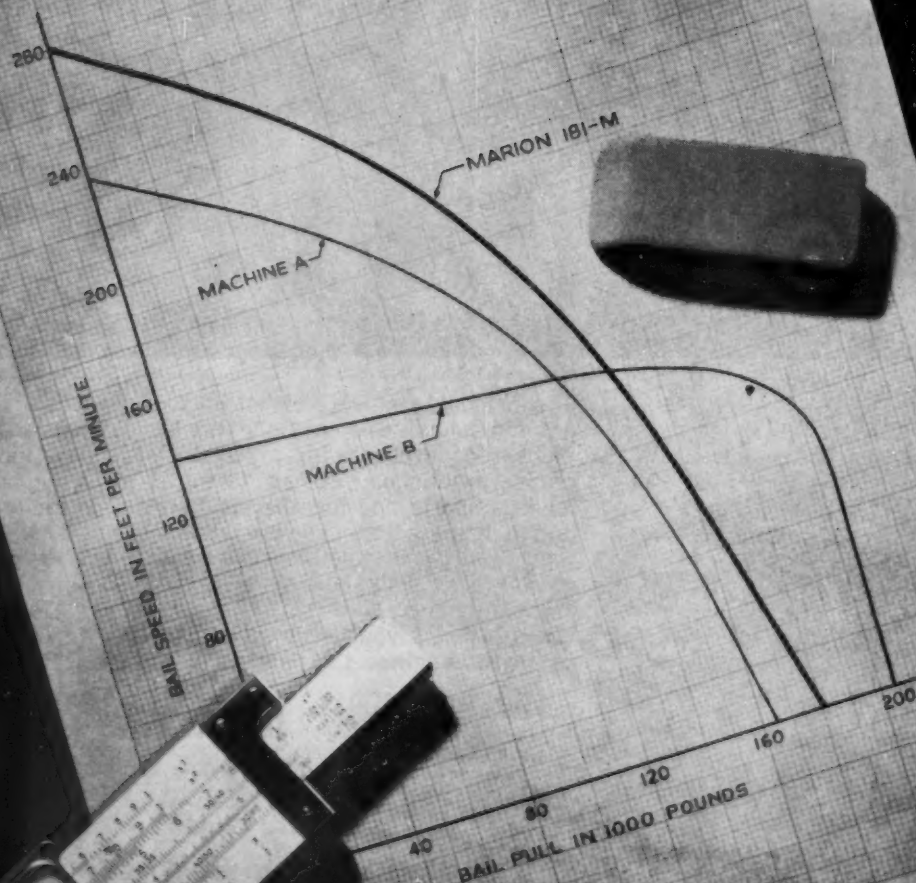
In the 35th National Safety Competition sponsored by the U. S. Bureau of Mines, two Iron Range mines were among six taking top honors. In the metal mines group, **Wauseca** mine at Iron River, Michigan won the award for operating 332,563 man-hours without a disabling injury. This is the first victory in 17 years of competition for the **Wauseca** mine, operated by **Hanna Mining Company**, subsidiary of **M. A. Hanna Company**. In the open-pit mine competition, the **Rouchleau** mine, Virginia, Minnesota, was honored for its record of 627,409 man-hours without a disabling injury. This was the second year in competition for **Rouchleau**, operated by **Oliver Iron Mining Division of United States Steel Corporation**.

An Upper Lake cargo record set by the "Edmund Fitzgerald" in August was expected to be surpassed with the constant deepening of the downbound channel of the Soo line locks. The present draft allowance at the Soo is 24 feet, 10 inches. Deepening of connecting channels in the Detroit and Soo area is expected to allow greater vessel depths in the next two years. The record cargo was 26,483.4 net tons of taconite pellets from Silver Bay. Earlier "The Edward L. Ryerson," an **Inland Steel Company** ship, loaded 26,183.4 tons of iron ore on her voyage from Escanaba, Mich.

THIS IS MARION QUALITY No question about it. You can have too much of a good thing. Take high bail pull on an excavator, for example. It means nothing until combined with speed. A practical amount of power is necessary... the amount Marion's variable voltage drives gives you to properly balance digging force AND speed to match the bank conditions. And, Marions have the machine weight to back up their power output and give long life. Wasted power is almost negligible since the operator can control the output to the requirement precisely—within the range of a few horsepower. If you'd like to have more bail pull than you'll ever need, we can (like other manufacturers) give it to you, plenty of it. But, at the expense of operating speeds, possible coil burnouts, clutch member seizure and high power loss in heat instead of useful work. Depends on what you want. We're betting on economy of operation and we think excavator owners are doing the same. Marion Power Shovel Company, Marion, Ohio. A Division of Universal Marion Corporation.



COMPARATIVE
BAIL SPEED VS. BAIL PULL CURVES



More Honors

FOR THE BIG



First source for...

"T-1"

Steel Castings

GOOD NEWS for the Western Metal Industry. Now Alloy Steel & Metals Co. can supply you with castings made from "T-1" Steel. Plate and bar stocks of this remarkable constructional alloy steel have been in use for several years, now it is available for the first time for castings. Its casting characteristics allow designers to take advantage of the physical properties without "over-design".

Alloy Steel & Metals Co. was selected as the first foundry to be licensed because of its outstanding performance in producing castings for defense projects.

Outstanding Advantages of "T-1" Alloy Steel Castings:

- A proven engineering material.
- Over 3 times the yield strength of structural carbon steel.
- Weldable without preheating or post-heating.
- Exceptional toughness, even at subzero temperatures.
- Outstanding resistance to the combination of impact abuse and abrasion.
- Reduces ultimate costs.
- Reduces weight safely—as much as 25% to 50%.
- Outstanding for meeting ASTM Specifications A 148 and A 352.

For complete information on "T-1" constructional alloy steel castings, send for new Engineering Bulletin No. 300-A2.

"T-1" is a registered trademark of United States Steel.



ALLOY STEEL & METALS CO.

1848 E. 55TH ST. • LOS ANGELES 58, CALIF. • Phone LUdlow 3-3471
Mailing Address: BOX 58323 VERNON STATION, LOS ANGELES 58

WHAT'S GOING ON... CENTRAL AND EASTERN

a capacity of 400,000 tons of wet-process 54 percent phosphoric acid annually. The new construction will also provide an increased tonnage of triple superphosphate. According to Wilbur G. Malcolm, president, the use of fertilizer in which his company's products are used has tripled within the last 15 years and is expected to double or triple again in the coming 25 years.

Iron Ranges

Mining operations of **The Pacific Isle Mining Company** the past season have been conducted on a number of properties extending from Aurora to Mountain Iron on the Mesabi Range. At Aurora is the **Meadow** mine, an underground operation later converted to an open pit. Pacific Isle also operates the **Wyoming** open pit mine at Virginia, which is a leasehold of the **Pittsburgh Pacific Company**. Several other properties—the **Iroquois**, **Wacoutach** and the south half of the **Missabe Mountain** property—are also producing iron ore for Pacific Isle.

Construction work on the new **Sherman** concentrator for **Oliver Iron Mining Division, United States Steel Corporation**, continues, with steelwork being erected by **American Bridge Company**. The five-story high beneficiation plant at Chisholm, Minnesota is being erected adjacent to the present **Sherman** re-screening plant. Operation is scheduled for next spring. The concentrator will treat low-grade ore produced from the **Monroe** and **Sherman** groups of mines.

An important mechanical transition carried out by **Reserve Mining Company** at its Silver Bay, Minnesota taconite concentrator involved lengthening of all rod and ball mills to increase capacity. The concentrator has 12 units, with a rod and a ball mill in each.

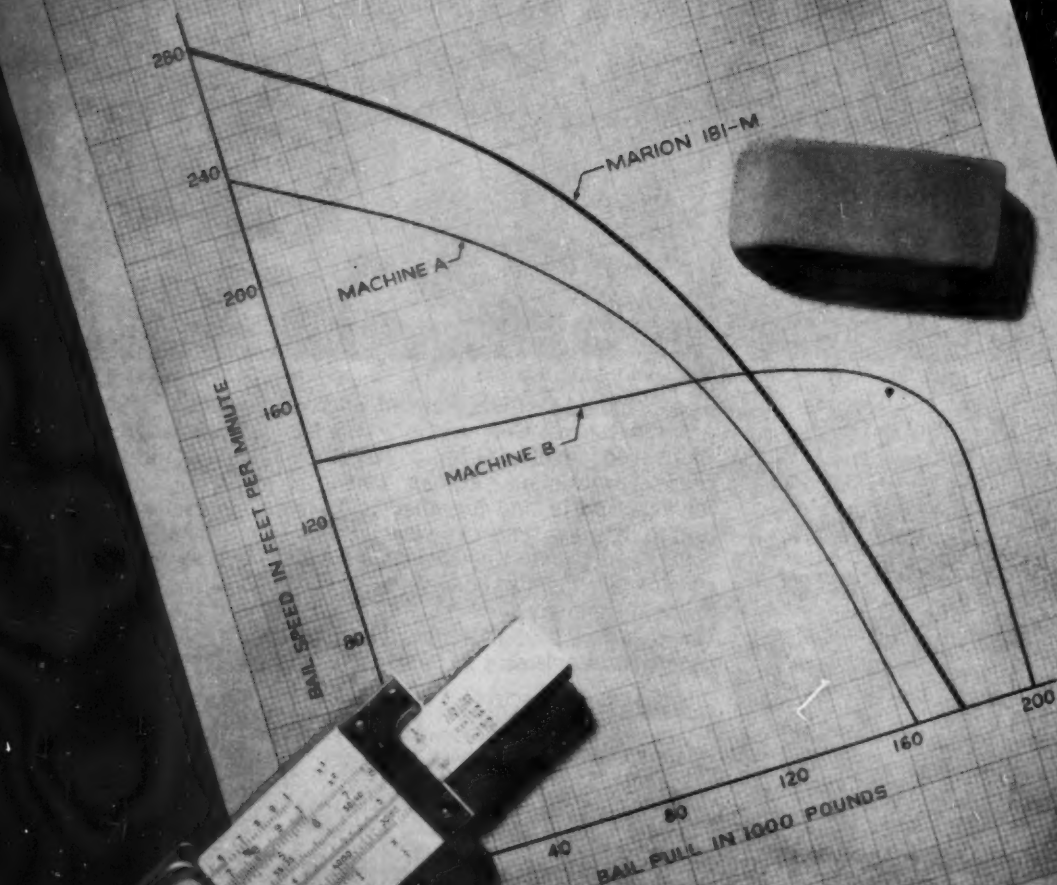
In the 35th National Safety Competition sponsored by the **U. S. Bureau of Mines**, two Iron Range mines were among six taking top honors. In the metal mines group, **Wauseca** mine at Iron River, Michigan won the award for operating 332,563 man-hours without a disabling injury. This is the first victory in 17 years of competition for the **Wauseca** mine, operated by **Hanna Mining Company**, subsidiary of **M. A. Hanna Company**. In the open-pit mine competition, the **Rouchleau** mine, Virginia, Minnesota, was honored for its record of 627,409 man-hours without a disabling injury. This was the second year in competition for **Rouchleau**, operated by **Oliver Iron Mining Division of United States Steel Corporation**.

An Upper Lake cargo record set by the "Edmund Fitzgerald" in August was expected to be surpassed with the constant deepening of the downbound channel of the Soo line locks. The present draft allowance at the Soo is 24 feet, 10 inches. Deepening of connecting channels in the Detroit and Soo area is expected to allow greater vessel depths in the next two years. The record cargo was 26,483.4 net tons of taconite pellets from Silver Bay. Earlier "The Edward L. Ryerson," an **Inland Steel Company** ship, loaded 26,183.4 tons of iron ore on her voyage from Escanaba, Mich.

THIS IS MARION QUALITY No question about it. You can have too much of a good thing. Take high bail pull on an excavator, for example. It means nothing until combined with speed. A practical amount of power is necessary...the amount Marion's variable voltage drives gives you to properly balance digging force AND speed to match the bank conditions. And, Marions have the machine weight to back up their power output and give long life. Wasted power is almost negligible since the operator can control the output to the requirement precisely—within the range of a few horsepower. If you'd like to have more bail pull than you'll ever need, we can (like other manufacturers) give it to you, plenty of it. But, at the expense of operating speeds, possible coil burnouts, clutch member seizure and high power loss in heat instead of useful work. Depends on what you want. We're betting on economy of operation and we think excavator owners are doing the same. Marion Power Shovel Company, Marion, Ohio. A Division of Universal Marion Corporation.

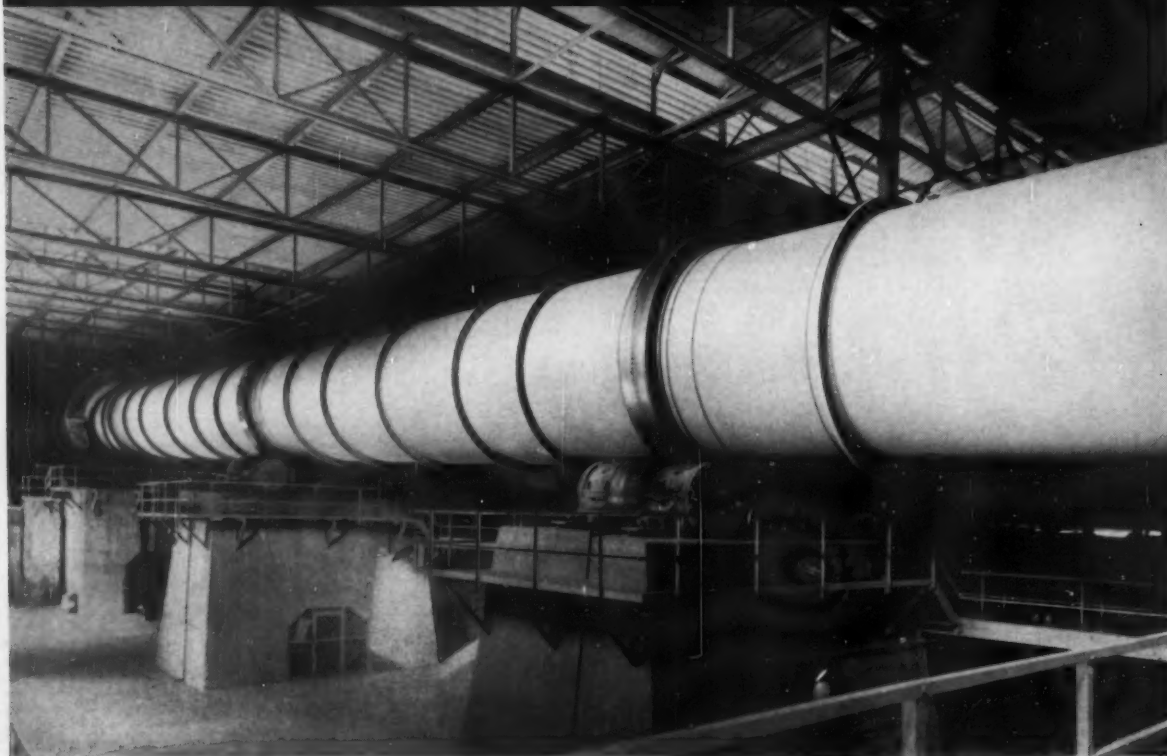


COMPARATIVE
BAIL SPEED VS. BAIL PULL CURVES



TRAYLOR-PIONEERED AND TRAYLOR-PERFECTED

efficiency built into this rotary kiln



Traylor engineers were called on to design this modern 450' kiln for Canada Cement Co. This kiln features many Traylor pioneered developments which decrease down time and increase production. It has full-thrust roller mechanism and roller supports tied together so that a rigid mounting is obtained insuring better kiln operation. The riding ring is mounted on machined steel pads which hold the ring securely in place but allow full-floating action, continuous operation and low maintenance.

Write outlining your kiln requirements for recommendations by Traylor engineers . . . and for Bulletin No. 1115.

This kiln at the Canada Cement Company in Montreal is 12' x 450'. Seven roller supports keep its 450 foot length in steady easy alignment.

TRAYLOR ENGINEERING & MANUFACTURING
DIVISION OF FULLER COMPANY
1558 MILL STREET, ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco
Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

TKA-11

WHAT'S GOING ON... SOUTHWEST



Basic, Incorporated, Completes Nevada Mill Expansion

A two-part expansion to be completed this month at the Gabbs, Nevada, plant of Basic, Incorporated will increase capacity of dead-burned high magnesia refractory clinker to 120,000 tons per year and provide facilities for manufacturing a broader line of magnesia refractory and chemical products. The Gabbs plant also produces about 30,000 tons annually of calcined magnesite. As part of the expansion project a second rotary kiln was installed which is supplied by powdered concentrate from a 500-ton-per-day flotation mill added in 1959. The new refractories plant will enable Basic to supply a full range of special refractories to steel mills throughout the world.

U. of Arizona Plans Surface Mining Program Oct. 17 to 19

The use of aerial survey mapping at the Esperanza pit of the Duval Sulphur and Potash Company will be discussed by R. H. Buchella, Jr. and Thomas Jancic of Duval at the closing technical session of the University of Arizona Surface Mining Symposium. The three-day meeting is being conducted by the College of Mines faculty and the mining industry October 17 through 19 in Tucson.

All open-pit mine operators are invited to attend the symposium, one of a series sponsored by the College of Mines. Reservations or additional information may be obtained by writing to H. E. Krumlauf, professor of mining engineering at the University.

The symposium includes four technical sessions, plus an optional trip to American Smelting and Refining Company's Mission Project on October 19. The Tuesday afternoon session speakers will also include F. G. Woodruff and E. C. Spears of Kennecott Copper Com-

pany on "Materials Handling at Ray Mines Division's Expanded Concentrator" and William R. Hardwick of the U. S. Bureau of Mines discussing "The Open-Pit Copper Mines (See MINING WORLD, September 1960, page 62, for other program highlights.)

Kennecott Applies for 53 Mineral Patents at Safford

Legal notices covering applications for mineral patent by Kennecott Copper Corporation are being published in Safford, Arizona. Mineral Application No. 026030 lists 42 claims for a total of 792.908 acres. Four other applications list 11 mining claims for a total of 218.2 acres, bringing the grand total to 53 claims covering 1,011.108 acres in the Lone Star Mining District of Graham County. Location notices for the big majority of these claims were filed in 1956 at which time Kennecott's exploration subsidiary began intensive work in the Safford area.

SuperDuty DIAGONAL DECK No. 6 CONCENTRATOR TABLE



To Concentrate Minerals with Utmost Efficiency

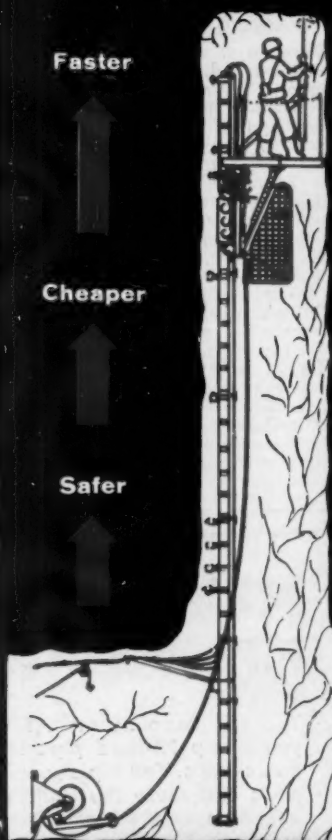
Mineral concentration with the SuperDuty® DIAGONAL-DECK® table is so simple, so easy to effect efficiently where you can actually watch the components separating on the deck, right before your eyes. Separations are exceptionally sharp, yielding highest grade concentrates, practically worthless tailings and a greatly reduced volume of middlings for recirculation. Send for Bulletin 118C.

The Deister Concentrator Co., Inc.

The Original Deister Co., Incorporated 1906
925 Glasgow Ave., Fort Wayne, Indiana

UP with ALIMAK Raise-Climber

Driving raises from 40 feet up to
1200 feet or more



The Climber lifts the operator to the working face. After drilling and loading, the unit lowers the operator and folds back for blasting. A ventilation system is incorporated through pipes in the guide rails.

A Product of Swedish Engineering



ALIMAK
CORPORATION
306 AVILA STREET
SAN FRANCISCO 23

A MINING WORLD "BLUE RIBBON"
AWARD WINNER

Arizona

Banner Mining Company has picked up some additional high-grade copper ore in deepening of an existing drill hole on the firm's Eisenhower group of claims at properties south of Tucson, Arizona. Banner is largely controlled by Salt Lake City interests. A drilling program with bores spaced 250 feet apart is now under way on these claims which ultimately will be tapped by the new million-dollar, five-compartment shaft of the company. A Banner official said the bedded copper ore was in rolls and for this reason the earlier drill hole had failed to penetrate the ore body.

Reserves of about 10,000,000 tons of iron ore are indicated in the White Mountain Apache Tribe lands recently leased by Colorado Fuel & Iron Corporation, according to R. R. Williams, Jr., manager of mines. (See MINING WORLD, August, 1960, page 47) If additional studies show the deposit to be materially larger, this would justify the expense involved in opening and operating a mine and providing transportation facilities in the wilderness area, Williams said. Reported deposits of asbestos, manganese, and coal in the area will also be investigated by CF&I which has the right to prospect for all minerals except oil and gas. The permit is for two years, with the right to extend it for two more years if desired. CF&I will continue prospecting work done by the U. S. Bureau of Mines and the United States Geological Survey over the area which covers 188 square miles in the northwestern section of the Indian Reservation.

The Southern Belle mine in the Oracle district in Pinal County, Arizona, is being opened by a group of lessees headed by Carl and Clarence Pierson of Oracle, Arizona. A small crew is engaged in building roads and cleaning out old adits in preparation for production. The operators plan on trucking the low-grade gold ore to the Asarco smelter at Hayden for use as silica flux, and the high-grade ore to Asarco at El Paso, Texas.

California

White Caps Gold Mining Company reports discovery of beryllium ore on property eight miles east of Lone Pine, California, purchased from William J. Sorensen. The property comprises four claims, with a bold outcrop running the length of the discovery claim. International Minerals & Chemical Corporation has bought an adjoining claim. Officials of White Caps believe that phenacite is indicated in its deposit. The U. S. Bureau of Mines, working under an agreement with previous and present owners, has dug trenches for sampling purposes. Ten cuts have been made on the property and over 200 samples taken. Samples taken by White Caps have averaged 0.42 percent BeO.

Nevada

American Exploration and Mining Company Ltd., a subsidiary of Placer Development Ltd. of Canada, has reportedly

purchased a 50 percent interest in an iron deposit near Lovelock, Nevada, for \$2,000,000. The property is under option to a major steel company and sufficient ore and market are indicated to support a profitable operation. American Exploration also has interests in the Philippines and in Mexico, and other properties are under examination.

Hercules Mines Company plans to reopen the Union mine, one of the most famous in the Austin, Nevada, area. It was formerly operated by Phelps Stokes interests. Recent exploration of the Sampson Claim on which the Union is located has caused interest.

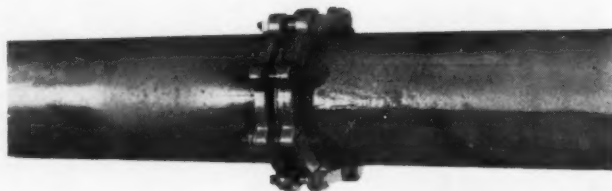
New Mexico

Resumption of operations at the San Mateo shaft of Rare Metals Corporation of America in the Grants, New Mexico, uranium district, is scheduled during October. The recently completed shaft collapsed earlier this year but has been rehabilitated. The company will now substitute a new method of mining, directly from the face, for the previously planned mining by dropping ore to sub-level drifts.

During a two-week shutdown of the Carlsbad, New Mexico, mine and refinery of U. S. Borax & Chemical Corporation, a second skip loader was installed at Shaft No. 3, which required construction of a new loadout facility in the ore pocket at the bottom of the shaft. The new skip is expected to double output of the Shaft No. 3 operation.

NEW NI-HARD* FLANGES SLASH PIPE INSTALLATION AND MAINTENANCE COSTS

You will have no more broken flanges when you clamp Ni-Hard pipe together with ductile iron clamps. You replace only the stock Ni-Hard parts and reuse the clamps. You need no expensive special flanged fittings because you can build what you need from our stock of ductile clamps in 125# and 250# drillings. Special drillings at nominal cost.



Ni-Hard elbows have increased metal section on the backs for additional wear.

* Ni-Hard, trade mark registered U. S. Pat. Off.

Rocky Mountain Conference In Salt Lake City Oct. 5-7

A panel of specialists will discuss costs and difficulties encountered in the various phases of exploration during an exploration symposium at the Rocky Mountain Minerals Conference this month. The session is meeting October 5-7 sponsored by the Utah Section, AIME, in Salt Lake City, with headquarters at the Hotel Newhouse.

Roland B. Mulcahy is host for the symposium, which will be presented by Francis Cameron, president, St. Joseph Lead Company; C. P. Pollock, exploration manager of American Smelting & Refining Company and Charles C. Huston, president of C. C. Huston & Associates of Toronto, Canada.

A discussion by Lockwood W. Ferris of Salt Lake City on "The Vicissitudes of Salt Production" will be a feature of the meeting's opening session Wednesday morning, October 5. Thursday morning speakers will be J. D. Vincent of American Smelting and Refining Company on "Reagent Systems Design"; D. H. Baker, Jr. and J. B. Zadra of the Reno, Nevada, Metallurgy Research Center, "Electrolytic Tungsten and Molybdenum"; a Kennecott Research Center staff member, "Role of Microorganisms in Leaching Processes"; and D. L. King, president of San Francisco Chemical Company, who will discuss that firm's Vernal phosphate project.

The program for Thursday afternoon includes Edward R. Borchardt of Borchardt & Smith, San Francisco, California, discussing "Electric Wheel Truck at the Berkeley Pit" and Edgar T. Hunter of

Standard Metals Corporation, speaking about "The Silverton Project" of his company.

The field trip Friday afternoon includes a 20-minute movie and a conducted tour through the Hercules Powder Company plant. Several traditional social events are also scheduled.

Rich Utah Potash Lands Released for Development

An accelerated development program for one of the country's richest potash areas is expected following the withdrawal of some 9,445 acres of public lands in southeastern Utah from oil and gas leasing. Announcement of the 10-year withdrawal was made recently by Secretary of the Interior Fred A. Seaton, who said the order will make it possible for the potash deposit to be developed.

Drilling of 18 holes through the potash deposits has not resulted in sustained production of oil and gas on the land, which is about nine miles southeast of Moab, Utah, near the Colorado River. However, once the potash has been mined out, further exploration for oil and gas would be possible. The government will receive as much as 5.0 percent royalty on the potash produced.

The high grade potash deposit has been located through systematic drilling by private firms. More than \$2,500,000 has already been spent in exploring for potash reserves in the area. According to drilling records, the deposit at Cane Creek will be mined at depths ranging from 2,500 to 5,000 feet.

Delhi-Taylor Oil Corporation of Dallas,

Texas, has been drilling in the Moab area since 1955 and has indicated large reserves. Recently the company announced an affiliation with Texas Gulf Sulphur Corporation and plans for establishing a large potash mining operation. Cost of the project has been estimated at more than \$20,000,000.

Drilling for the project was completed in September and an extensive study of results is being made by Texas Gulf Sulphur and the Colorado School of Mines Research Foundation in Golden, Colorado. At least four separate geological studies have been made, the latest one concentrated on possible shaft location. Geologists reportedly have a pretty good picture of the ore body by now and the information necessary to select a shaft site.

According to James Ogg, project geologist, correlation of the data is now under way for a presentation to company directors. Dr. C. F. Fogarty is vice president of exploration, and Frank Tippie, project manager. The presentation is expected to be made soon, since Texas Gulf Sulphur's option from Delhi-Taylor expires in January.

Reported development plans for the Utah project include sinking of a 3,000-foot deep mine shaft and building of a 37-mile railroad and a processing plant.

Colorado

Standard Metals Corporation has started shipment of lead concentrate from its Silverton, Colorado, flotation mill to Asarco's Leadville smelter. The mill is

You see six sections of 8" pipe weighing 2,826 lbs. hoisted on 30 ft. centers. While we don't recommend supports every 30 ft., we do know that you can use fewer supports with this method than with regular flanged Ni-Hard pipe.

Abrasion resistant fittings are now available from Brom for all Ni-Hard pipe. Made to eliminate the usual flange casting and installation problems they also accommodate the heavier sections desired in Ni-Hard. When used with easily installed ductile iron clamps you can rotate the pipes at any time to distribute the wear evenly. For complete information on all sizes of Ni-Hard pipe and fittings for the mining industry, write today for a free booklet.

New zincing flange adds to versatility. Designed specifically for use when Ni-Hard pipe or fittings must be cut to special length. You can now complete a job from your stock without waiting for special cast lengths.



THE BROM MACHINE and FOUNDRY CO.

3565 6th STREET -- WINONA, MINNESOTA

This Red Rubber is a better rubber for runners pumping abrasive pulps because it has...



**Higher tensile
strength**

**Higher tear
resistance**

**High resilience
and
Greater abrasion
resistance**

**This permits handling coarser pulps at
higher pumping speeds and heads... at lower costs!***

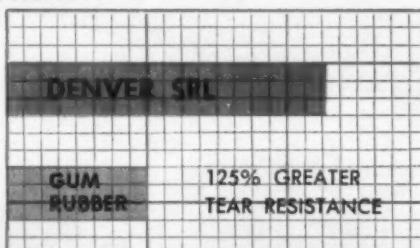
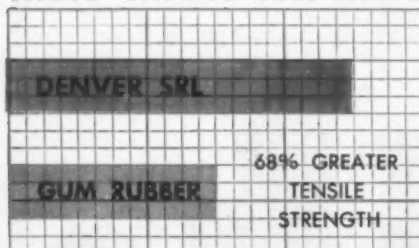
This abrasive resistant stock is standard on all runners for DENVER SRL and SRL "Tru-Glandless" Pumps (sizes to 10" x 8"). Other polymers are available for applications involving high temperatures, oils or acids where abrasion is a secondary problem.

These DENVER SRL Pump runners are especially suited for pumping grinding mill discharge to cyclone classifiers where coarse particles (up to 3/4") normally would be a problem.

Tough, live DENVER SRL Red Rubber outwears, outlasts, outperforms generally-used gum rubber and allows DENVER SRL Rubber Lined Pumps to be used where metal pumps have been considered necessary.

**We are interested in cutting your pumping costs—and we have the pumps to do it! Give us a chance at your toughest pumping job.*

THESE CHARTS TELL THE STORY....



**= { MORE WEARING LIFE
MORE \$\$\$s SAVED**

Complete Mineral Processing Equipment

"The firm that makes its friends happier, healthier and wealthier"



DENVER EQUIPMENT COMPANY

Cable DECO DENVER

1400 Seventeenth St.

Phone Cherry 4-4466

Denver 17, Colorado

- NEW YORK CITY
4114 Empire State Bldg.
Phone CH 4-6810
- BLUEFIELD, W. VA.
P.O. Box 1536 • Phone O'Connell 3-6398
- LONDON
15-17 Christopher St., Finsbury Sq.
Phone Bishopsgate 0636
- JOHANNESBURG
Broadway and Ninth
Bez Valley • Phone 25-7531
- TORONTO
185 Kay Street
Phone EMpire 3-8836
- VANCOUVER
803 Credit Foncier Bldg.
Phone MInnial 3-7393
- MEXICO CITY
Avenida Juarez 14, Desp. 615
Phone 21-1477
- LIMA
Proquimarios 270
Calle 4250 • Phone 41887

WHAT'S GOING ON...

ROCKY MOUNTAIN

now handling about 500 tons daily. Custom ore will be accepted for a time and this ore will be diverted to the new sampling plant which is expected to be completed soon. Development at the company's Silver Lake property, is proceeding rapidly and an improvement in grade of ore is expected as mining advances. The American Tunnel being driven from Gladstone is now in over 8,000 feet, putting the heading within 2,400 feet of the Washington vein of the Sunnyside mine. An advance of 675 feet was made during August. In the first part of the tunnel slabbing was used to enlarge the old 7 by 7 bore to about 9 by 10 feet. Slabbing has been completed for a passing track. About 30 feet is driven a day. The company has already moved considerable material and mining equipment by road to the Terry Tunnel.

Operations at the new 500-ton-per-day lead-zinc flotation mill of **Camp Bird Colorado, Inc.** in Ouray County, Colorado, are scheduled to start in mid-October. According to B. B. Bailey, the new manager, all underground workings of the mine are being rehabilitated since the mine has not been in operation for over three years.

At the **Little Dora Mine** operated by **Fall River Mining Company** south of Silverton, Colorado, ore encountered in drifting is reportedly full-face wide and higher than average grade. The company is making trial mill runs at its **Pride of the West** mill at Howardsville.

The **Micawber** lead-zinc properties of **Standard Metals Corporation** in the Crested Butte district of Colorado will be shut down permanently unless there is a material improvement in domestic lead and zinc quotations as a result of Congressional or Federal action. The mine is operating at present but the operation is marginal at today's prices, according to **William R. McCormick**, **Standard Metals'** president.

South Dakota

Homestake Mining Company is undertaking a \$1,500,000 construction program to increase production at its **Lead**, **South Dakota**, gold mine. The two-year project is designed to expand output from the present 1,750,000 tons to 2,000,000 annual tons. Output of gold this year has been running below that of 1959 because of the slightly lower grade of ore treated. Nearly half of the profits for Homestake during the first half of this year came from the company's uranium operations.

Operations at the new \$600,000 vanadium circuit of **Mines Development Company** near Edgemont, **South Dakota**, are scheduled to start this fall. **Mines Development** is a subsidiary of **Susquehanna Corporation** and also operates a uranium processing mill at Edgemont.

Utah

First company to receive an OME loan under a new program to encourage development of domestic beryllium reserves



The Getman Brothers' KD-5A Scoot-Crete uses an air-cooled Deutz Diesel.



Reason: no warmup needed. Runs effectively from 40° below to 140° above (and it's approved by the Bureau of Mines.)



Fuel goes farther—every drop is burned.



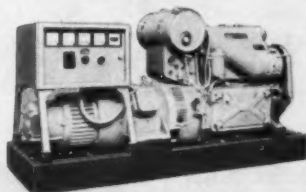
So there's less down time—no sulphurous acid condensation—hardly ever a carbon job.



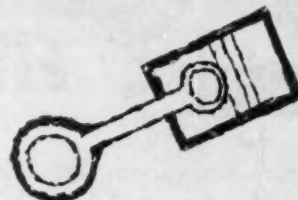
No water system; maintenance bills go down. You get full H.P. rating; no power lost for cooling.



Good reasons why Wagner ore carriers, Wagner scoopmobiles, the Jones Jackass and the Young Shuttle Buggy run on Deutz Diesels, too.



Deutz air-cooled Diesels are also used on generators, compressors, stand-by power equipment.



Complete parts and service facilities right where you need them.

PARTIAL MODEL	SPECIFICATION BHP	TABLE RPM
F1L 712	13	2300
F2L 712	26	2300
F3L 712	39	2300
F4L 712	52	2300
F6L 712	78	2300
F/A3L 514	48	1800
F/A2L 514	32	1800
A4L 514	72	2000
A6L 514	110	2000
AGL 614	110	2000
A8L 614	145	2000
A12L 614	220	2000
AGL 714	125	2000
A8L 714	168	2000
A12L 714	250	2000

Full range: 5 to 310 BHP in 1, 2, 3, 4, 6, 8, and 12 cylinders.



DIESEL ENERGY CORPORATION
82 Beaver Street
New York 5, N. Y.

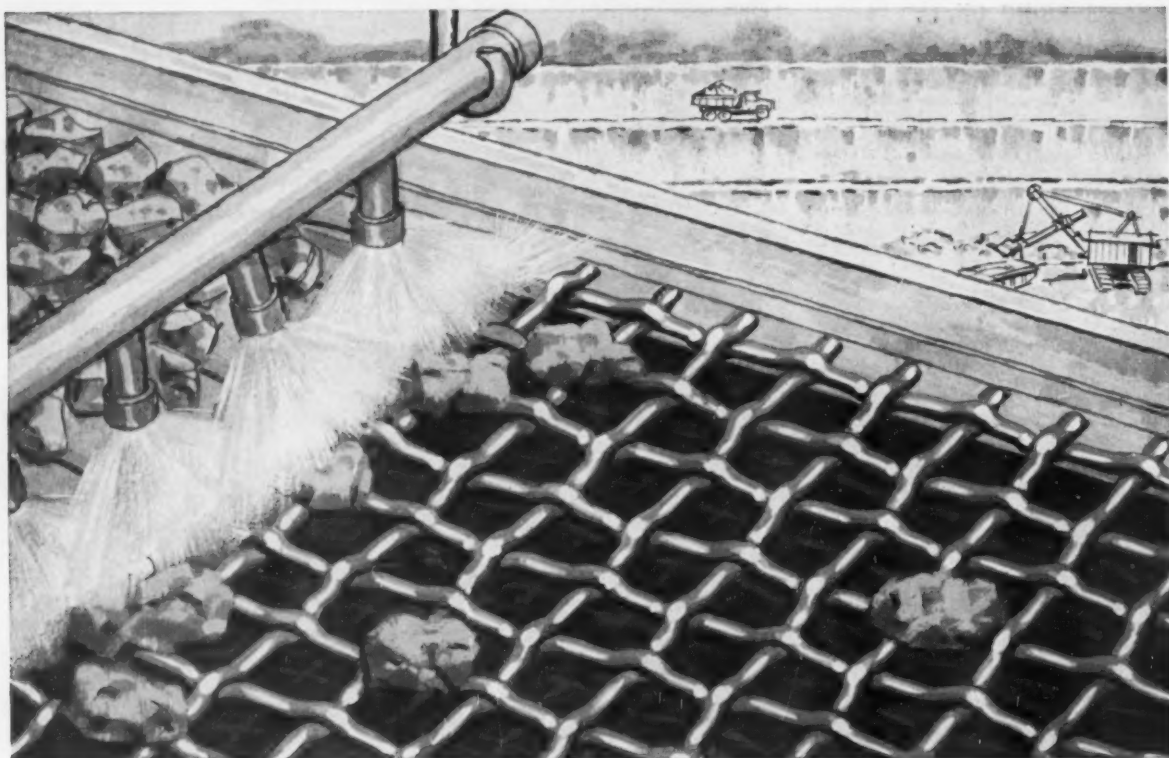
Please send catalogs covering the range I have checked, DEPT. MW-2

☐ 10-90 HP ☐ 100-310 HP
I am a ☐ Dealer ☐ Manufacturer
☐ Operator

Name _____

Address _____

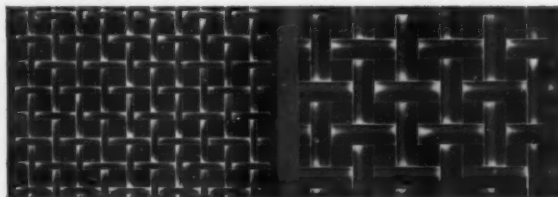
City _____ Zone _____ State _____



High throughput? Long service life?

CF&I SPACE SCREENS FILL EITHER REQUIREMENT

To meet the varying operational requirements throughout the Mining industry, CF&I Space Screens are produced in a great variety of weaves, crimps and edge preparations. Wire sizes range up to 1", with screen openings as large as 6". The capability of CF&I to provide the exact screen you need is another one of the meanings represented by our Corporate Image.



For fast screening — high throughput. Effective open area 60%.

For slow screening — long service life. Effective open area 30%.

Both screens have the same size openings.

For complete information on all types of CF&I Space Screens, contact your local CF&I sales office.

CF&I SPACE SCREENS
THE COLORADO FUEL AND IRON CORPORATION



In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Farmington (N.M.)
Ft. Worth • Fresno • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Sacramento • Salt Lake City
San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia
CF&I OFFICE IN CANADA: Montreal CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

7568

WHAT'S GOING ON... ROCKY MOUNTAIN

was Vitro Minerals Corporation of Salt Lake City, Utah. Vitro will use the federal funds to prospect for beryllium in the Spor-Topaz Mountain area northwest of Delta, Utah, where test drilling on 10 percent of the claim area has indicated a sizeable deposit of a new type of beryllium ore named "vitroite." Although the OME loan is relatively small, federal support of the search for low grade, economically amenable, disseminated beryllium indicates that such ores may well exist in quantity in this country. Processing development studies at Vitro Chemical Company laboratories indicate the ore is readily soluble in sulphuric acid and also suitable for reduction at Vitro's uranium processing plant in Salt Lake City. Vitro Minerals is a subsidiary of Vitro Corporation of American and Rochester & Pittsburgh Coal Company. The beryllium discovery was announced this June.

Experiments in the use of oxygen in copper smelting are planned by Kennecott Copper Corporation at its Garfield, Utah, smelter. Contracts for pilot plant equipment costing some \$750,000 have been awarded, after previous experimentation at the firm's Salt Lake City, Utah research center and also at its Chino, New Mexico division. Kennecott will test the use of oxygen in speeding process time in reverberatory furnaces and will employ oxygen lancing in the introduction of gas into furnaces. Other major copper producers are reportedly studying application of oxygen to nonferrous metals smelting.

Marvel Mining Company of Salt Lake City, Utah, is driving an adit into its lead-silver-zinc property to determine the size of the ore zone discovered recently cropping out in the Clifton mining district of Juab County, Utah. The discovery on this outcrop prompted the company to start development in the district, which is about seven miles east of the Utah-Nevada boundary.

An agreement between Standard Metals Company of Moab, Utah, and Texas-Zinc Minerals Corporation that involves over \$20,000,000, calls for Texas-Zinc to act as an agent in selling Standard Metals' uranium concentrates to the AEC. Under the agreement some 2,866,000 pounds of uranium oxide would be produced between July 1, 1960 and Dec. 31, 1966 from ores mined at Standard's Big Buck Mine in San Juan County, Utah. Standard will be paid Circular Five prices for ores sent to Texas-Zinc's Mexican Hat uranium concentrator between July 1, 1960 and March 31, 1962, and after that will receive \$8.00 a pound. The contract will enable Standard to ship the bulk of its low grade ores between now and March, 1962, when higher prices are available. After that it will be advantageous to ship high grade ore, according to W. R. McCormick, president of Standard. Texas-Zinc announced that the recent contract will not affect small, independent producers in the area tributary to the Mexican Hat mill. At least 50 percent of the mill's capacity will be reserved for independent producers.

A high-grade lead-silver-zinc vein on its Tintic District, Utah, properties has been extended another 200 feet through drilling by Kennecott Copper Corporation. This area is about 1,000 feet west of the Burgin shaft where an incline winze is

being sunk, and about 300 feet from properties of the Tintic Standard Mining Company which Kennecott's Bear Creek subsidiary had explored earlier. Discoveries in this unit have all been on properties of Chief Consolidated Mining Company and affiliates. Kennecott recovered some 63 feet of ore out of a 217-foot hole with ore assaying 23.47 percent zinc; 14.3 percent lead, and 4.1 ounces of silver per ton.

Wyoming

About 250 workers have begun double shift operations in building Columbia-Geneva Steel Division's taconite processing plant near Atlantic City, Wyoming. The work force is expected to double

when construction begins on the new 77-mile long Union Pacific Railroad Company line to Winton Junction. The railroad eventually will haul beneficiated iron ore to Geneva works near Provo, Utah.

Hack Engineering Company of Denver, Colorado, has a contract from Lucky June Mining Company of Denver to engineer and erect a small mill to process uranium ore (schroekingite) from its deposit near Rawlins, Wyoming. A new process will be used in which the total reagent and chemical cost is less than 20 cents per ton of ore processed. The initial cost of the mill is approximately 50 percent of the cost per ton of conventional mills now in operation and no stainless steel or rubber-lined equipment is necessary, reports A. Hask, president.

GOSH! ALL THOSE ADVANTAGES IN BEMIS SAFETY YELLOW

NYPRENE

FLEXIPIPE®

Yep, count 'em. Compare Flexipipe with any metal ventilating tubing and you'll confirm this check list . . .

- LABOR INSTALLATION COST FAR LESS.
- NYPRENE FLEXIPIPE WEIGHS ONLY ONE-TENTH TO ONE-FIFTEENTH AS MUCH.
- BETTER CONNECTIONS, MINIMUM AIR LOSS.
- NO DENTS (AND DENTS IN METAL ARE TOUGH TO FIX).
- EASIER TO DISMANTLE.
- TAKES MUCH LESS STORAGE SPACE.
- DOES NOT RUST OR ROT; RESISTS ACIDS.
- NEVER NEEDS PAINTING.
- NO ON-THE-JOB FABRICATING NECESSARY.
- FLEXIPIPE DOMESTIC FREIGHT PREPAID.
- EXPORT SHIPPING COSTS LOWER.

WRITE OR WIRE FOR COMPLETE INFORMATION AND SAMPLE OF BEMIS FLEXIPIPE.

Bemis



111 N. Fourth Street, Box 23, St. Louis 2



Adv. No. 152

Longyear

PRODUCTS: Diamond core drilling equipment and supplies (center: Unitized Longyear "24" drill rig on 4-wheel-drive Jeep) . . . Longyear diamond bits . . . Longyear multi-speed drilling pumps . . . Longyear Wire Line.

WORLD WIDE SERVICES: *Contract Drilling*—Wire Line and conventional core drilling by experienced drill crews with modern equipment—to date: over 1 million feet with Wire Line . . . *Consulting*—Geological and mining consultation . . . *Air Photo Interpretation* (photogeology, road and site planning) . . . Valuation of mining property for loans, leases, sale . . . Mineral exploration and appraisal.



E. J. LONGYEAR COMPANY
Minneapolis 2, Minnesota, U.S.A.

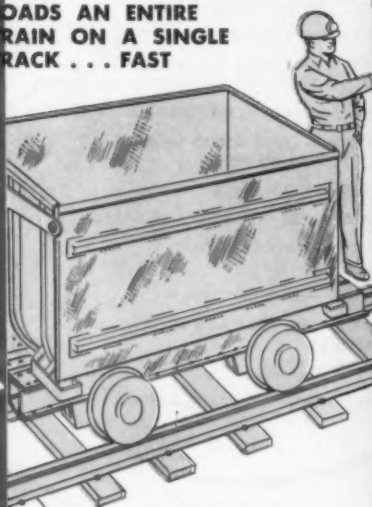
Member: Diamond Core
Drill Manufacturers Assn.

CANADIAN LONGYEAR LTD., NORTH BAY, ONT./LONGYEAR ET CIE, PARIS, FRANCE/LONGYEAR N.V., THE HAGUE, HOLLAND/LONGYEAR de MEXICO, S.A. de C.V., SAN BARTOLO, MEXICO

**50%
FASTER
WITH
AIR
POWER**

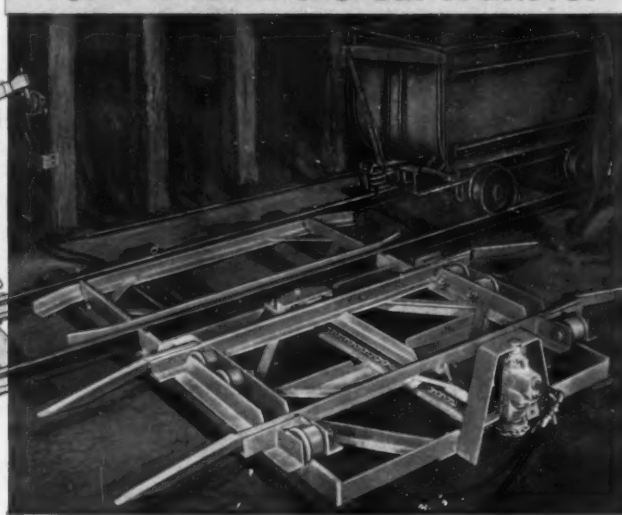
NOW.. the 'Canton' Air-Power Car Transfer

LOADS AN ENTIRE
TRAIN ON A SINGLE
TRACK . . . FAST



—for Single
Track Loading—fast

Also self-liquidating: Track Cleaners, Rock Dusters, Electric Switch Throws, Automatic Mine Doors, Cable Splicers and Vulcanizers. See our 2-color full page ad in Mining World Catalog, Survey & Directory Number, April 25, 1960.



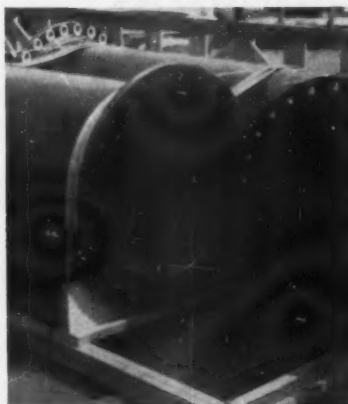
Now—one man does the work of three.

Cars shuttled transversely back and forth to clear track while loading empties. "Canton" Car Transfer quickly re-installed to new track location a trip length out-by loader . . . no alteration of track . . . eliminates expensive slabbing for double tracks or for California switch. No more hazards of cherry picker. Motorman pulls empties in, pulls loads out. The "Canton" Car Transfer loading cycle is fastest for most profit. Write for quotations now units, and converting your present units to Air Power.

The AMERICAN MINE DOOR CO.
2871 DUEBER AVE., CANTON 6, OHIO



YOU KNOW ABOUT OUR NAVY, BUT HOW ABOUT



OUR SEAGOING PIPE?

The pipe pictured is seagoing—to be used at a big copper mill in Peru for seawater intake at the power plant. Thirty-six inches in diameter, the pipe is lined AND coated with Paralene® RD and has an absolutely unlimited life expectancy in this service.

Paralene RD is non-oxidizing and resistant to most acids, alkalis, and salt derivatives. In addition, Paralene RD resists—eliminates completely in most cases—scale formation in the pipe. The smooth, smooth lining is seamless, eliminating an inherent weakness of other pipe linings.

If you have a corrosive piping problem, it will pay you to investigate Paralined pipe.

BARBER-WEBB

3864 SANTA FE AVE., LOS ANGELES 58
PHOENIX
SALT LAKE CITY SAN FRANCISCO

Your ONE source for

- PLASTICS
- TANK LINING
- PIPE LINING
- ALL CORROSION AND ABRASION NEEDS

© Reg. TM Barber-Webb

WHAT'S GOING ON... NORTHWEST

Beryllium Deposit Located In Remote Idaho District

Beryl containing up to 14.0 percent beryllium oxide has been found widely disseminated over an area of a few square miles in the primitive Glens Peak area, 40 miles northwest of Sun Valley, in south Central Idaho.

The widespread occurrence of the space-age metal was reported by a team of mining engineers from the Spokane, Washington, field office of the U. S. Bureau of Mines, which had been searching for the metal with a mobile spectrographic laboratory in cooperation with the Idaho Bureau of Mines.

The engineers and geologists found the widespread mineralization in alaskite, a light-colored rock, after a prospector brought out a sample of beryl. Access to the area, which is from 8,000 to 10,000 feet above sea level, is by a 15-mile trail from Pettit Lake, or Atlanta. This, together with a short working season, poses problems for future exploration and development work, according to Bureau officials. Prospectors are advised to consult with the forest supervisors at Boise or Twin Falls concerning entry into the primitive area.

The Sawtooth area deposits include a two-foot wide fissure filled by a pegmatitic dike with aquamarine beryl, according to David Wayne Young, Moscow, Idaho, an assistant to the director of the Idaho Bureau of Mines and Geology.

He said the deposit in the northeast corner of Elmore County was "definitely not a disseminated beryllium ore," such as phenakite, bertrandite, or helvite.

Alaska

Mt. Andrews Mining Company of Vancouver, mining subsidiary of Utah Construction & Mining Company, has optioned a large group of iron ore claims in Alaska from Don Ross of Ketchikan. The property on Cleveland Peninsula is at Vixen inlet, a short distance from extensive holdings of United States Corporation. The Canadian firm will start an exploration program, and equipment for a camp has been flown to the site by helicopter. The magnetic iron ore on the claims was discovered during aerial prospecting last year by Ross, who used an airborne magnetometer.

Idaho

The Silver Summit mine of Hecla Mining Company near Osburn, Idaho, produced 11,769 tons of ore assaying 33.4 ounces of silver per ton during the first six months of this year. Salvage of equipment in the Rainbow-Triangle and the American Silver-Silver Standard areas is continuing.

Drift work is underway at the Minnie Moore mine near Hailey, Blaine County, Idaho by Silver Star Queens-Mines, Inc., to try to locate a lost ore-shoot at the former producer. Funds are being raised through assessments. R. W. Decker, is secretary.

Hall Mountain Thorite Mining Company is doing bulldozer stripping explora-



**Just name
your pump
requirements!**

**John Bean handles the big
jobs, the small jobs, the
TOUGH jobs**

John Bean High Pressure Reciprocating Pumps provide capacities from 0.5 gpm to 100 gpm and pressures from 100 psi to 12,000 psi.

LOOK FOR THESE LOW-MAINTENANCE FEATURES:

- ★ Inside or outside packed.
- ★ Lifetime sapphire cylinders or plungers.
- ★ "Roto-Splash" lubrication to all drive end parts.
- ★ Distortion-free cast iron housings for constant bearing alignment.
- ★ Replaceable valve seats and free-acting, ball-type valves—easy maintenance.

ALSO: packaged power pumping units, custom designed pumps, and high pressure washing units...

WRITE FOR FREE CATALOG



INDUSTRIAL PUMPS

Dept. MW-4
San Jose 1, Calif. Lansing 4, Mich.

MODEL 660-C

WARN-A-ALARM BACK-UP BELL

U.S. PAT.
NO. 2,915,036



CERTIFIED

TO MEET

U.S. ENGINEERS

CONTRACT REQUIREMENTS

U. S. ARMY ENGINEER SPECIFICATIONS

* (Ore., Wash., Idaho, Mont. and Alaska Division)
Paragraph 18-12, EM 385-1-1, March 1958, Modified; as revised July 26, 1960, for self-propelled construction equipment. (Condensed version.)

SOUND INTENSITY: 90-100 decibels at 5' horizontal distance from alarm.

-tone VALUE—OCTAVE RANGE (per ASA Standard Octave Passband): Peaks within 600-2400 cycles per sec.

DURATION OF AUDIBLE WARNING at specified sound intensity: Minimum 0.2 to 0.5 sec. within initial 3 ft. of reverse movement of vehicle.

FREQUENCY OF ALARM: Regular intervals of 3 sec. or less at normal reverse speeds. (Frequency of warning increases with vehicle speed with Warn-A-Larm.)

AUTOMATIC CONTROL: Sound automatically stops when vehicle stops. Silent in forward motion. Warn-A-Larm attaches to rear wheel, is gravity actuated.

Workers forget . . . Warn-A-Larm doesn't. Approximately a day's pay for a truck driver equips a vehicle with Warn-A-Larm. Self-contained, gravity actuated, it automatically rings in reverse 4 times per wheel revolution. Attaches simply to a rear wheel hub—no other connections. See your safety equipment source today, or contact us direct.

WARN SALES CO.

Riverton Box 6132-A, Seattle 58, Wash.

YOU GET MORE THAN THE ORDINARY

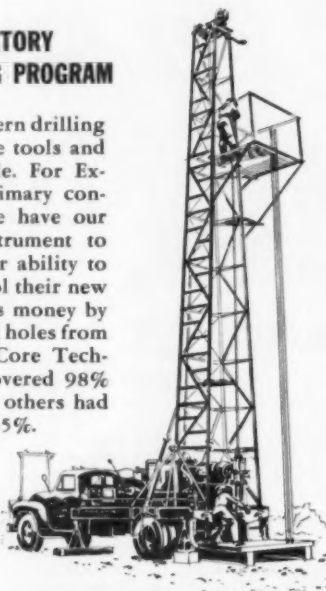
with an



**EXPLORATORY
DRILLING PROGRAM**

In addition to the latest, most modern drilling machines and equipment, we have tools and techniques not generally available. For Example: Where our customer's primary concern is an "on-course" hole, we have our Craelius Drill Hole Survey Instrument to guide us. On deep hole work our ability to deflect holes and accurately control their new direction has saved our customers money by eliminating the need for additional holes from the surface. Using our "Frozen-Core Technique" we have successfully recovered 98% core in sand and siltstone where others had previously recovered only 60 to 65%.

Ours is not "just an ordinary service" . . . When you are planning your next exploratory drilling project, give us an opportunity to show you how well we can serve you.



SPRAGUE & HENWOOD, Inc.

SCRANTON 2, PA.



New York—Philadelphia—Nashville—Pittsburgh—Grand Junction, Colo.—Buchans, Nfld.
Export Division: Sprague & Henwood International Corporation, 11 W. 42nd St., New York, N. Y.

tion at its mining claims near Porthill, Boundary County, Idaho and also is building a work cabin. Bruce R. Berringer of Spokane is president and manager.

Montana

American Metal Climax Company is again drilling and evaluating the Big Ben mine located on Carpenter Creek close to Niehart, Montana. So far most of the work has consisted of diamond drilling. There is a promising show of molybdenum in this area.

Another molybdenum development in Montana is the opening up of claims by Potee Incorporated. These claims are located about six miles east of Alhambra. The mine is developed by an open pit and some underground workings. A 50-ton per day mill is being installed on the property so that mill tests on the ore can be made.

Oregon

Placer ground on the west bank of Pine Creek six miles north of Halfway, Baker County, Oregon, is being tested by the McDonald Brothers, who plan to sample the ground by cutting trenches to bedrock, which is about 65 feet below the surface. The property is owned by Milton Steinmetz. Equipment includes a slack line cable-way and slusher powered by a double drum Diesel hoist, and a grizzly and sluiceway setup with a capacity of about 500 yards per day.

A lower adit is being driven at the Buffalo mine in Grant County's Granite district in Oregon to tap an ore body which has yielded both shipping and milling-grade gold ore for many years. J. P. Jackson Jr. is in charge of the mine.

Washington

Core drilling is planned by Rosaia Mining Company of Seattle on its lease in the Silver Creek mining district of Washington. Several other firms are active in the area, but development has slowed down until results of this drilling are obtained and interpreted.

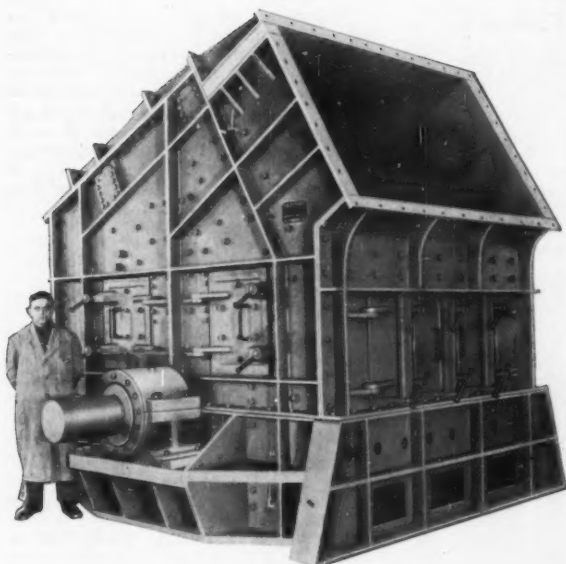
Tungsten and tin concentrates from the Silver Hill mine, five miles south of Spokane, Washington, may be purchased by Wah Chang Corporation. Tungsten would be processed at that firm's \$11,-000,000 processing plant at Glen Cove, New York, while tin concentrates would go to Texas City, Texas, for smelting. Wah Chang has tested concentrates processed locally from the Silver Hill ore. The tungsten is molybdenum-free. Ore stripping and stockpiling operations continue at the property and milling machinery is being acquired, according to Carl A. Coon, principal owner of the Silver Hill property. Daybreak Uranium, Inc. also has an interest in the venture.

The report that Lakeview Mining Company was starting a stripping program that appeared in the September issue of MINING WORLD was in error. Stripping and mining were discontinued there several months ago. MINING WORLD regrets the error and takes this opportunity to retract the report.

HAZEMAG IMPACT CRUSHERS...

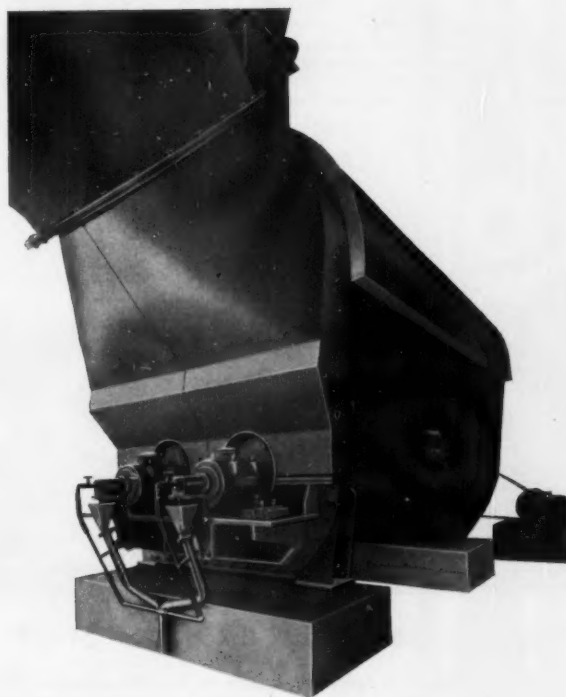
mean low cost, high tonnage crushing
with a high reduction ratio.

Many thousands field proven top performance units throughout the world.



HAZEMAG RAPID DRYER

The
simple, effective and
economical way
to dry bulk material



HAZEMAG U. S. A., Inc.
122 East 42nd St., Room
3702A, N.Y. 17, N.Y.
HAZEMAG HARTZERKLEINERUNGS-
Und ZEMENTMASCHINENBAU-GESELL-
SCHAFT MBH Munster i.W. Germany, Loddeneide 31, Postfach 576

HAZEMAG

Joy Manufacturing Co., through its offices in Pittsburgh, Pa., U. S. A., Galt, Ontario, Canada, and Greenock/Scotland, Cappelow, is now handling complete sales and distribution of Hazemag Impact Crushers in the United States, Canada, Mexico and Great Britain.

INTERNATIONAL NEWS

Cananea Explores Chalcocite Copper Deposit in Mexico

Cananea Consolidated Copper Company, S. A. is exploring a copper deposit in the Municipality of Piquita, Sonora, Mexico. The copper mineral is chalcocite; the ore reportedly averages 2.0 percent copper. The deposit will have to be mined by underground methods because the overburden is approximately 600 feet thick.

Cananea is a subsidiary of The Anaconda Company. Copper production for the firm last year totalled 64,363,013 pounds.

British Guiana Alumina Plant Nears Completion

Completion of a 235,000-tons-per-year alumina plant, biggest single industrial project yet undertaken in British Guiana, is scheduled in the next few months. The \$35,000,000 plant being built by Demerara Bauxite Company Ltd. early next year will start producing alumina from bauxite in the Demerara River district.

The plant is located on the northeast coast near Mackenzie where bauxite has been mined and processed since 1916. Its site is in dense tropical bush which

can be reached only by boat or seaplane.

Demerara Bauxite is a subsidiary of Aluminium Company of Canada Ltd. Output of the plant will be shipped to Canadian smelters for processing into aluminum.

Quebec Cartier Plans Iron Ore Shipments in February

Quebec Cartier Mining Company expects to start shipments from its \$300,000-000 Lac Jeannine project in February. The northern Quebec project may produce up to 20,000,000 tons of crude ore when operations are in full swing.

At Lac Jeannine, one of the world's largest beneficiating plants will concentrate ore directly from the open-pit mine to a 65 percent concentrate. Ore from the 330-acre ore body is assayed at from 30 to 45 percent iron.

The project includes the concentrator, a hydro-electric plant, a railroad covering 193 miles to Port Cartier, a harbor, and two townships.

Although the Lac Jeannine mine has an expected life of 20 years, Quebec Cartier, wholly owned subsidiary of United States Steel Corporation, is presently looking for deposits even farther north at Mt. Reed and Mt. Wright.

Japan Acts to Open Up New Lead-Zinc District in Peru

Mitsubishi Shoji Kaisha, Ltd. was the only bidder for a 26-mile extension of the Cuzco-Quillabamba Railway line which should open up a new lead-zinc district in south central Peru.

Reportedly, the Japanese company has offered to invest \$30,000,000 in this Peruvian railroad construction if satisfactory agreements can be reached between the Japanese and Peruvian governments.

The extension contract is scheduled for completion within two years and is worth about \$4,000,000. Payment will be made over 10 years in lead and zinc ores, and anthracite coal which occur in the Vilcabamba mountain range.

Broken Hill in 75th Year Looks Good for Another 50

In the 75th year of activity at the fabulously rich silver-lead-zinc deposits of Broken Hill in New South Wales, the field still has enough estimated reserves to keep the mines busy for another half century at present rate of extraction.

August 13 marked the 75th anniversary of the formation of the first company to work on the renowned producer. Today four major companies are active there—North Broken Hill Ltd., South Broken Hill Ltd., Zinc Corporation Ltd., and New Broken Hill Ltd.

In the fiscal year ended June 30, North Broken Hill increased throughput of its mill slightly from 362,657 tons last year to 363,306 tons. Despite a slightly higher grade lead concentrate, production decreased slightly from 70,179 tons last year to 69,551 tons. Production of zinc concentrate rose from 73,786 tons to 75,043 tons, although grade fell slightly. Average assay values were lead 14.5 percent (previous year 14.45 percent); zinc 11.83 (11.84) and silver 7.45 (7.22) ounces per ton.

At South Broken Hill production figures for the year ended June 30 were slightly lower than for the previous year, probably because of voluntary production curtailment. Ore treated totalled 277,270 tons against 297,290 tons in 1959. Production of lead concentrates decreased from 48,080 tons in 1959 to 42,485 tons, and zinc concentrates from 58,945 to 49,809 tons. Lead yield was 31,345 tons this year; zinc yield 25,529 tons, and yield of silver 1,645,703 ounces.

\$180,000,000 Steel Plant Scheduled in Turkey

Three United States firms have been awarded a contract for the \$180,000,000 integrated steel plant to be built in Turkey. Blaw-Knox Company, Westinghouse Electric Corporation, and Koppers Company, Inc., all of Pittsburgh, Pennsylvania, received a contract for engineering, procurement, construction supervision and some equipment for the new steel mill scheduled for construction at the Black Sea port of Ereğli.



Krupp Bucket Wheel Excavator Strips French Mine

In this strip-mining at Arjuzanx, France, a movable conveyor bridge links the bucket wheel excavator with a boom stacker which dumps the overburden directly into the worked-out area of the open pit. The 13-foot-thick lignite deposit is covered by up to 100 feet of soil. The excavator and stacker unit was made by Fried. Krupp Maschinen- und Stahlbau Rheinhausen of Rheinhausen, West Germany. Used mainly in Europe and Australia for removing overburden and for open-pit lignite mining, the excavators and conveyors are also finding increased applications in the United States, Canada, Africa and other parts of the world in diverse climatic conditions. The excavator type in which the bucket wheel carries out a virtually horizontal slewing motion is particularly suitable for selective mining of stratified deposits comprising layers of varying thickness. A wheel carries six to 12 scooping buckets, depending on size and output. Specific cutting (digging) power requirements are low because of the continuous digging principle, while the even load imposed on structural members of the excavator during cutting greatly reduces maintenance and repair costs. In the case of small wheels, the excavated material is directly loaded over an attached stacker boom which pivots independently from the bucket wheel; on larger wheels, as shown here, the discharge is passed to an independent crawler-mounted loader. Sizes range from dwarf excavators which handle 90 cubic yards per hour to giants with daily output of 200,000 cubic yards and cutting heights of 250 feet.

Africa

LIBERIA—An Export-Import Bank credit for \$6,000,000 in favor of the **National Iron Ore Company** will assist in development of iron ore deposits in the Mano River district, with the loan to be used for purchasing United States equipment, materials, and engineering services. National Iron Ore, partly owned by the Liberian government, will spend another \$2,300,000 in the United States for materials including railroad equipment, heavy mining and mine auxiliary machinery, ore processing items and construction materials. Total cost of the Mano River project is estimated at \$23,300,000, exclusive of working capital. An ore output of 4,000,000 tons annually is expected by 1963.

FEDERATION OF RHODESIA & NYASALAND—A new shaft-sinking record has been set by the **Cementation Group's** Rhodesian company to top the previous record at the Mufulira West mine of Mufulira Copper Mines Ltd. Cementation teams have sunk and lined 451 feet in one month at the new No. 14 shaft (earlier record 415 feet). Despite hard blocky granite the Rhodesian shaft sinkers hope soon to reach an all-time high figure of 500 feet a month. About 180 tons of rock are broken per round; mucking is done with a mechanical grab having a capacity of 75 tons an hour. Concrete lining is being done simultaneously with sinking, using 12½-foot shut-tering.

UNION OF SOUTH AFRICA—**Barrington Chrysotile Asbestos Ltd.** has increased its milling rate to 57,739 tons in the second quarter of this year, as well as reducing costs to £39.60 a ton. Treatment of accumulated broken ore drawn from two sections of the mine and the consequent elimination of drilling, blasting, and certain labor costs offset the lower grade of the ore to make the operation more profitable. Earlier this year the tonnage of broken ore was estimated at 700,000 tons.

FEDERATION OF RHODESIA & NYASALAND—Extensive improvements are being made by **Nchanga Consolidated Copper Mines Ltd.** in its project to rehabilitate the concentrating plant at its Chingola operation. The spiral classifiers, which have been in service for 20 years, are being replaced with 36-inch cyclones to increase efficiency of the grinding section. The secondary ore crusher for the Chingola open pit has been commissioned and the X-ray spectograph put into service. Other improvements include installation of a Blacke Dennison weigher, to weigh ore fed into the grinding plant; modern change rooms and workshops between the secondary ore crushers and the mill; new offices, and a modern laboratory. Construction of a new lime plant has been started also.

GHANA—A conditional agreement by the United States to provide \$30,000,000 towards financing the Volta River hydro-electric project has been made with the Ghanaian government. The agreement hinges on the Ghanaian government reaching "a satisfactory arrangement" with owners (Ghana Aluminium Ltd.) of a proposed aluminium plant to be built nearby and the additional financing needed for the \$164,000,000 project. Announcement of the agreement followed talks between

K. A. Gvedemah, Ghana's finance minister, and officials of the World Bank. The Export-Import Bank, and United States government representatives. No decision has been made on how the money may be made available to Ghana, but it will probably be in the form of a loan.

UNION OF SOUTH AFRICA—In the lease area of **Free State Geduld Mines Ltd.** a 24-foot-lined diameter circular shaft will be sunk to a depth of 5,000 feet. It will be located adjacent to the ventilation shaft now nearing completion, which will then serve as the hoisting component in a twin-shaft system. The twin-shaft system, together with the existing No. 1 shaft, will provide all necessary ventilation for the western section and will be able to cope with the severely faulted conditions. Location

of the new shaft near the common boundary with **Western Holdings Ltd.** will make it possible, if necessary, for ventilation flow and disposal for the two mines to be put on a mutual basis. Cost of the new main shaft with auxiliary equipment will be about \$8,000,000.

FRENCH WEST AFRICA—A vein of gold ore at the 202 level which has been located by the **Poura Mining Syndicate** in the Upper Volta area is expected to triple ore reserves, now estimated at 350,000 tons with a grade of more than 18 grams of gold per ton. The pilot plant produces 50 tons of concentrate monthly, with the grade varying from 1.0 to 2.5 kilograms per ton. A treatment plant which began operation in July has a capacity of 200 tons of ore per day, which will be increased first to 400 tons and eventually to 1,000 tons per day.

RESEARCH and EXPERIENCE

SPANG'S

Answer to Improved DRILLING BITS

After 65 years in the field, Spang research engineers are still constantly working to improve the performance of cable system drilling tools.

This policy of continued research has provided Spang Drilling Bits with:

IMPROVED precision machining of the threaded joint.

LONGER, stronger pin collars.

TOUGHER, sturdier blade sections.

GREATER hardenability potential on the drilling end giving deeper penetration with fewer dressings.

Put Spang Research Experience to work for you—ask for **SPANG DRILLING BITS** in heat-treated Molloy (molybdenum silicon alloy steel) or heat-treated high carbon steel.

SPANG & COMPANY

BUTLER, PENNSYLVANIA

BRANCHES: Bolivar, N. Y., Mt. Pleasant, Mich., Winfield, Kan., Cisco, Texas

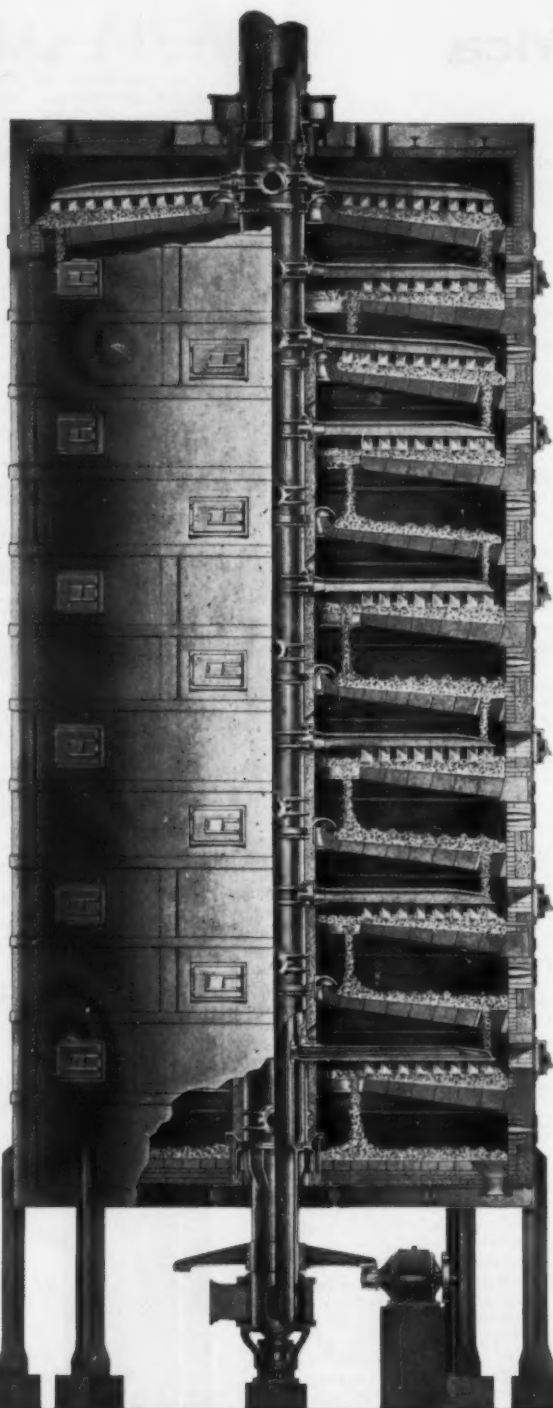
PACIFIC FURNACES

*for Roasting, Calcining,
Drying, and Incinerating—
Ores, Sludges, Chemicals,
and Organic Materials.*

- Multiple Hearth Furnaces
- Annular Furnaces
- Stack Kilns
- Dryers
- Retorts

Pacific, with more than a half century of know-how and experience in furnace design and construction, maintains complete laboratory facilities and equipment for making pilot runs, either batch or continuous. Thus you are assured of a furnace design, based on actual test operation, that will most efficiently meet your exact requirements.

You are invited to avail yourself of Pacific's consultation service. There is no obligation; for an immediate reply write to:



PACIFIC FOUNDRY AND METALLURGY CO.

NEW YORK • SAN FRANCISCO

3100 Nineteenth Street, San Francisco, California • 551 Fifth Avenue, New York City

WHAT'S GOING ON... INTERNATIONAL

MALAGASY REPUBLIC—The Societe Ugine is interested in developing chromite lenses discovered recently in the Andriamena region where the ore is fairly low in chrome oxide but amenable to treatment in combination with higher grade ores. Reserves are estimated at 1,000,000 tons. Full development depends on construction of road or railway facilities for economical transportation. The Ugine firm is also investigating nickel deposits at Valorazo. The ore there is fairly low grade but can be concentrated by a special process developed recently. Construction of treatment plants and a hydroelectric project is planned in the future when the nickel market improves.

UNION OF SOUTH AFRICA—Free State Saaiplaas Gold Mining Company Ltd. has started development off-reef from its recently completed No. 2 shaft, and has continued reef development in the No. 1 Shaft area where values have declined sharply to 283 inch-dwts.

UNION OF SOUTH AFRICA — In order to accelerate start of production, Leslie Gold Mines Ltd. will sink the ventilation component of its twin-shaft system to about 2,050 feet instead of 3,100 feet. This will make it possible to make an earlier start on reef development in the shaft area where reef depth is about 1,500 feet. The shaft will be sunk, as planned, to 3,100 feet and is designed to supply the mill with about 100,000 tons per month. The strike of the sub-outcrop zone more or less conforms to the southern boundary, about 700 feet below surface, while the dip northwards is between 25 and 30 degrees. Maximum reef depth is about 4,500 feet. Fairly severe faulting through the lease area of 4,225 claims is indicated. Capacity of the mill will be 75,000 to 90,000 tons a month initially and gradually raised to an ultimate tonnage of 150,000 to 180,000 per month.

FRENCH WEST AFRICA—A port to handle output from the manganese deposits at Grand-Lahou on the Ivory Coast has been completed recently. Located at the entrance to the Vridi Canal near Abidjan, the port can stock 30,000 tons of ore. Ships can be loaded at the rate of 700 to 800 tons per hour. The Mokta Company in June began mining the deposits on the basis of 100,000 tons of ore per year. Known ore reserves are approximately 1,400,000 tons, but about 600,000 tons are fairly low grade so should be concentrated on the spot.

FEDERATION OF RHODESIA & NYASALAND—Current expansion programs in the Copperbelt may increase capacity of copper mines by close to 50 percent more than the highest tonnage in the past. This increase was predicted as a result of a recent regional survey of potential development in the area. Based on the rather high production figures of 1959, copper production is expected to rise 38 percent by 1970, and 45 percent by 1980. Tonnage of ore mined and copper produced has nearly doubled since 1948, due to investment in new projects as well as profitable production from previously operating mines. The increase predicted will probably not come from any entirely new mineral discoveries but from ore projects currently under devel-

opment such as Konkola, Chambishi and Baluba. In the near future, additional ore reserves will probably be located through expanded drilling programs outwards and downwards in areas adjacent to existing mines. Total investment in Copperbelt mineral projects is now about \$700,000,000.

Canada

ONTARIO—Jones & Laughlin Steel Corporation is undertaking an accelerated diamond drilling program on its iron property in Boston Township about seven miles southeast of Kirkland Lake. The program is to obtain accurate information about the attitude of the deposit and its dip at various points along the walls of proposed open pits. The company will ship about 200 tons of typical magnetite from the deposit to research laboratories for metallurgical testing. Although there has been no official estimate of ore reserves, the property reportedly is expected to provide over 32,000,000 tons of high grade iron concentrate. Jones & Laughlin is also continuing its drilling program on the Mount Wright property leased from Quebec Cobalt and Exploration Ltd. Five or six holes have been completed this season in the drilling designed to locate extensions to the known magnetite deposit and also to test two smaller isolated anomalies which have not yet been explored.

NORTHWEST TERRITORIES—Surface trenching has been started by Canada Tungsten Mining Corporation on a new tungsten find on its property in the Flat River area. The company is using an X-ray drill to assist in the investigation. Two heavy drills are being used on the main deposit testing extensions to the north and south. Heavy depth of talus in one direction and steeper contours up the mountainside on the other have made drilling difficult, but results are encouraging. Three geologists are engaged in the surface mapping program covering all the company's 83 claims in the area, which is about 150 miles north of Watson Lake. At the site of the airport, for which the Dominion government has agreed to pay half the cost, 5,800 feet has been cleared, with rough grading completed for 3,000 feet.

SASKATCHEWAN—Because of the grouting procedure being carried out at the Patience Lake mine of Potash Company of America Ltd. the 3,500-foot shaft cannot be used for hoisting ore. The grouting is expected to be completed early next summer, but at present it is difficult to determine when operations can be resumed. The company is making studies about modifications necessary in the concentrating plant and underground equipment. Potash Company is the first company to reach the potash beds in Saskatchewan. The ore is of the excellent grade and thickness indicated by preliminary exploration work, and despite the unexpected difficulties caused by water coming into the shaft the company hopes to bring the property into successful commercial production as soon as possible.

BRITISH COLUMBIA — A six-man crew is preparing the old Ottawa silver-lead-zinc mine near Slocan City, Kootenay Mining Division, for production. Yukon Western Mining Company, Edmonton, is the operator.

**Move More Muck
at less cost
with the RIGHT
ROPE MASTER**



**ROPE MASTER
SLUSHER BLOCKS**

are

"Built to stay on the Job"

Streamlined Design,
Correct Balance,
Oversize Throats,
Hardened and precision-
ground Sheave Pins,
Positive Grease Seals
are only a few of the many
exclusive features, plus—



**ROPE MASTER MINING BLOCKS
ARE AVAILABLE WITH THESE FITTINGS**

SWIVEL HOOK
PLAIN SHACKLE
SWIVEL SHACKLE
FLAT TYPE SHACKLE
SAFETY SWIVEL HOOK
SNATCH LOCK

**INCREASE WIRE ROPE LIFE—
REDUCE WIRE ROPE COST**

PAUL E. KEENEY CO.

**1125 S. E. Grand Avenue
Portland 14, Oregon**

STOP COSTLY CORING!

Get exact stratification samples with uninterrupted 100% recovery of cuttings.

HOUSTON HI-VAC INJECTOR DRILLING SYSTEMS.

Heavy Duty MODEL H.D. 250
2 3/8" to 3 1/2" Hole
Also Larger Models

THE MIGHTY MIDGET

Rugged Portable Exploration Drill
1 1/2" Hole to 100 Feet

MODERN EFFICIENT VACUUM DRILLING

Ten Drills In One — Dry or Wet
All Formations — No Guess-Work
All Angles — No Dust

Job-Proven Around The World

HOUSTON TOOL CO.
Santa Susana, California, U.S.A.

Export Division: 301 Clay St., San Francisco 11, Calif.

MAGMA COPPER COMPANY

Buyers of

**COPPER, GOLD
AND SILVER ORES**

MINES AND SMELTER AT

SUPERIOR, ARIZONA



Smelting

on the

Site

- Furnaces
- Sintering Hearths

Saves high transportation and treatment charges on your ores and concentrates.

The Mace Company

FIRE CONCENTRATION METALLURGISTS

2763 Blake Street, Denver 3, Colo. U.S.A.

WRITE TODAY

for literature

on

Mace Furnaces

and

Sintering

Hearths

AMERICAN ZINC LEAD AND SMELTING COMPANY

Buyers of zinc concentrates suitable for smelting in retort and electrolytic smelting plants.

Address communications to
Ore Buying Department

Paul Brown Building
ST. LOUIS, MISSOURI

927 Old National
Bank Building
SPOKANE, WASH.

P. O. Box 577
DUMAS, TEXAS

WHAT'S GOING ON . . . INTERNATIONAL

QUEBEC—Rio Tinto Canadian Exploration is exploring a large gold-base metals prospect in northwestern Quebec where it has a working option on properties of **Quebelle Mines**. The properties are about 40 miles north of Senneterre in Laas, Tonnacourt and Quevillon Townships near Cedar Rapids. Drilling is already under way, following an airborne survey over the 157 claims. Ground surveys indicate some five anomalous areas that warrant drilling. One of these contains gold showings and the remainder are base metals possibilities.

BRITISH COLUMBIA — The **Lone Bachelor** mine near Sandon, Kootenay Mining Division, is being returned to a shipping basis by Eli Perepolkin, who has leased the property from **Violamarc Mines, Ltd.**

QUEBEC—A final decision on the date for starting production at its columbium mine is expected soon for **St. Lawrence River Mines Ltd.** A new pilot plant in Montreal indicates promising results from the company's primary concentration process, which upgrades 45 percent concentrate to obtain a chemical concentrate that contains more than 90 percent columbium pentoxide. Proven reserves on the **St. Lawrence Oka** property and on that of **Oka Columbian & Metals Ltd.** total about 62,600,000 tons. Of this tonnage, about 18,000,000 have an average grade of 0.36 percent columbium pentoxide and the rest about 0.40 percent.

NEW BRUNSWICK—Zinc and lead mines in the Bathurst area of New Brunswick's northeast coast are expected to resume production again, according to M. J. Boylen, president of **Brunswick Mining & Smelting Company**. The Brunswick firm and **Sogemines Ltd.** of Belgium are co-operating in restoration of the mining area. **Sogemines** will invest \$17,500,000 in the project, with a 15-year contract to dispose of lead-zinc concentrates to Belgian firms. The Canadian company will spend over \$250,000 this year in exploration in the Bathurst area. Production is expected to be about 2,000 tons a day.

ONTARIO — **Temagami Mining Company** drilling east of its No. 6 ore body has encountered a new occurrence similar to other high grade ore bodies on its copper property near Temagami. Results are described as quite encouraging and drilling continues. Most of the company's current mining is on the No. 6 ore body some 1,800 feet west of the shaft between the 525-foot and 825-foot levels. The No. 2 high grade surface ore zone about 1,300 feet east of the shaft is being prepared for mining. Previously mined by open-pit methods, No. 2 is estimated to contain about 8,800 tons grading from 9 to 10 percent copper. The No. 6 ore body contains an estimated 45,175 tons grading 9.1 percent copper between the 525-foot and 825-foot levels. Drilling last winter picked up the upward extension between the 525-foot level and the bottom of Phillips Bay, with an additional 10,000 tons grading 7 to 8 percent copper indicated.

BRITISH COLUMBIA—The **Paradise** silver-lead-zinc mine in the Invermere district, closed in 1952 because of low

metal prices, has been reopened by **Sheep Creek Mines, Ltd.** Ore is being treated in the firm's mill at its **Mineral King** mine in the same district. Lead concentrates are going to the East Helena, Montana, smelter; zinc concentrates to the Great Falls, Montana, zinc plant. H. E. Doelle is managing director.

Asia

PAKISTAN—Production of chromite in West Pakistan will be doubled by 1964, according to present government plans. The chromite found in the area around **Hindu Bagh** is all exported. Present output is 20,000 tons a year; goal for 1964 is 50,000 tons.

MALAYA—Total export of tin concentrates from the Federation of Malaya in first half of this year was 27,783 long tons metal content, against permitted exports of 27,746 long tons. Production of tin-in-concentrates from mines in the Federation during June amounted to 4,298 long tons metal content, bringing total production for the year to 25,018 long tons.

INDIA—**Mysore Iron and Steel Works** will expand its ferro-alloy plant in collaboration with **A/S Elektrokemisk** of Norway, at a cost of about \$2,700,000. **Demag** of West Germany will expand the electric furnace and light structural mill of the works at a cost of about \$14,000,000. Mysore is being converted into a public corporation.



Experience the world over

Over thirty-three years of aerial survey work all over the world go into the planning and execution of every Fairchild project. So, whether the job is in Peoria or Peru, in New Jersey or New Guinea, you can be sure . . . if you need it done fast, and right the first time . . . you can depend on Fairchild.

Aerial photography
Topographic contour maps
Airborne geophysics
Marine Sonoprobe® surveys
Electronic positioning services
*A trademark

FAIRCHILD
AERIAL SURVEYS, INC.

LOS ANGELES, CALIF.: 224 E. Eleventh St. • NEW YORK CITY, N.Y.: 10 Rockefeller Plaza • CHICAGO, ILL.: Daily News Plaza, 400 W. Madison St. • BOSTON, MASS.: 255 Atlantic Ave. • BIRMINGHAM, ALA.: 2229½ First Ave. • DENVER, COLO.: 2620 So. Ivy • WASHINGTON, D.C.: 1625 I St., N.W. • ROME, ITALY: Via Nazionale 163

WHAT'S GOING ON...

INTERNATIONAL

MALAYA—Although men in the Federation's tin mining industry welcomed the United Nations Tin Conference decision to set up a new International Tin Agreement in 1961, they were disappointed in some aspects. First is the decision of the United States to continue her policy of "benevolent neutrality"; second comes the refusal of Russia, a major consumer and producer, to join in the new agreement, and third is the decision of the conference to reduce the present buffer stock of 25,000 tons by

only 5,000 tons. Malaya's tin miners paid 55,440,671 Malayan dollars as their share of financing the present buffer stock fund and, it is believed, pressed for reduction of the buffer stock to 15,000 tons. The delegation recommended the government's ratification of the agreement.

INDIA—An intensified program for mining sulphur, lead, zinc, and copper is planned in the near future, according to K. D. Malaviga, Minister of Mines. Location of extensive deposits of free sulphur in the Andaman Islands is expected. Preparations for mining copper at Khetri in Rajasthan are also being accelerated. Deposits in that area are believed to be of considerable size, with those at Koliha and Singhan presumed to be part of the same belt. Some time

ago mining experts had estimated 28,000,000 tons of ore in a strike length of 25,000 feet in that vicinity.

MALAYA—Taiping Consolidated Ltd. is reassembling its Kundang dredge at Taiping where operations are expected to start near the end of next year. The company has made a \$100,000 (Malayan) provision against estimated expenditure on the diversion of the Kota River in the Taiping section of its mining leases. Work on the diversion was begun last year. The considerable expense involved in moving the dredge to Taiping is expected to be justified by the Taiping operations, where the property has an estimated life of two years. The Kundang property was depleted in 1958.

THAILAND—The Thai government has granted special long-term prospecting rights over the western part of the province of Surathani to **Eastern Mining Development Company**, commonly known as **Burapa**. The company, operator of a hard-rock chrome mine, was previously appointed government representative in the purchase of tin from mine operators for the barter agreement under which tin was bartered for tobacco from the United States.

INDIA—India's export of iron ore may reach 15,000,000 tons in another six years, more than four times what it was in the 1959-1960 period. This estimate was made in a recent committee report on port development. Indian production of iron ore last year was a record-breaking 7,930,000 tons compared with 6,130,000 the preceding year, with an increase of 60 percent in ore going to steel plants and a 30 percent increase in exports over 1958. Start of production at the three public steel plants, plus expansion of private plants added to domestic requirements. Japan, main importer of Indian iron ore, is aiding in development of new mines to insure adequate tonnage for home consumption and export. Total output of iron in this year's first quarter was 2,553,000 tons, compared with 1,951,000 tons in the same period last year. Orissa was the chief producer with Bihar, Mysore, Madhya Pradesh, and Bombay the other leading states.

MALAYA—The Penang Port Commission has invited iron ore miners and shippers to discuss a proposed \$1,000,000 project for loading ore directly to ships at Prai, replacing the present system of using small boats for transportation from wharf to ship. A conveyor-belt system similar to that recently installed by **Perak Mining Company** at Lumut, at the mouth of the River Dindings, is under study. Several other iron ore companies are considering plans to construct loading facilities in the area.

PAKISTAN—To encourage greater private investment, both local and foreign, in developing the country's mineral resources, the government has granted special concessions to the mining industry, in addition to tax concessions given all industries. The concessions allow inclusion of all capital expenditure on machinery and equipment as revenue expenditure, while all expenditure on prospecting and exploration up to the stage of commercial production will be allowed against future income after commercial production begins. Further, if the mineral is refined or concentrated in Pakistan, profit equal to five percent of the capital invested shall be tax free for five years.



More
profit-time
here

with BRUNNER & LAY Rok-Bits and drill steel

Brunner & Lay rock drilling tools are the mainstay of operators who must keep up fast, uninterrupted drilling. They produce ROUND, easily-loaded blast holes. Provide better and bigger chip clearance, to keep hole cleaning operations at a minimum. The job-fitted carbides stay put to give big daily footage, at lowest cost. Proved on every type job, and machine.

Check your present tools against them. Call our local dealer, or nearest plant—request catalog #759.

BOOTH 1629 LAS VEGAS
Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. Est. 1882. Plants & conversion shops: Albuquerque, Asheville, Birmingham, Dallas, Long Island City, Los Angeles, Philadelphia, Sacramento, Seattle, Lachine, Que.

Brunner & Lay carbide ROK-BITS • DRILL RODS

INTRASET STEEL • COUPLINGS, ADAPTERS, SECTIONAL STEEL, STRIKING BARS • Standard or ROPE thread • MOIL POINTS, CLAY SPADES, ASPHALT CUTTERS, etc.

INSPIRATION CONSOLIDATED COPPER COMPANY

formerly
International Smelting and
Refining Co.
(Miami Plant)

Buyers of
Copper, Silver and Gold
Ore and Concentrates

Address: Smelting Department
Inspiration Consolidated Copper Co.
Inspiration, Arizona

International Smelting and Refining Co.



Buyers of

Lead & Zinc Ores
and Concentrates

Lead and Lead-Zinc Smelter
Lead-Zinc Concentrator } Tooele, Utah

Address: Ore Purchasing Department

International Smelting and Refining Co.

815 Kearns Building
Salt Lake City, Utah
Please establish contact prior to shipment



The 42 LB.
GRIPHOIST
TIRFOR

**LIFTS • PULLS
LOWERS
3300 LBS.
Single Line
6 TONS
OR MORE**
with pulley blocks

Replaces chain
hoists, air hoists,
winches . . . less cost,
less maintenance.
Unlimited cable travel,
portable, hand
operated . . . faster,
cuts rigging time . . .
unmatched safety
record.

One Year Guarantee
East of Mississippi
PRINCETON GRIPHOIST, Inc.
32 George St.
Boston 19, Mass.
West of Mississippi
GRIPHOIST, INC.
744 Harrison St.
San Francisco 7, Calif.

1/2" wire rope

**3,300
LBS.**

Come See Us at Mining Show Booth 1318

PURCHASERS OF

LEAD AND ZINC

CONCENTRATES

THE
BUNKER HILL
COMPANY

Producers of Top Quality Products

LEAD • ZINC • CADMIUM • SILVER • LEAD AND LEAD ALLOY PRODUCTS • CHEMICAL PRODUCTS

WIRE
PHONE
WRITE

ORE PURCHASING DEPT. • THE BUNKER HILL COMPANY
Telephone: SUNset 4-1261 • P. O. Box 29, Kellogg, Idaho

acker

**PACKSACK WORKS
SAFELY UNDERGROUND
ON COMPRESSED AIR!**

Now, safety powered by compressed air, the Acker Packsack answers every need for a lightweight core drill for the mining industry.

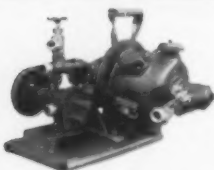
The Packsack sets up quickly and is easy to operate — even where space is at a minimum. Use it for test holes, blast holes, plotting veins, wall sampling and exploration drilling.

For surface mining, the Packsack is available with a thrifty 5.5 H. P. gasoline powered drill.

Write today for Bulletin 22-MW.



AIR MOTOR DRIVEN PUMP



Lightweight air motor driven pressure pump weighs only 70 lbs. Capacity 10 g.p.m. Makes a compact portable pumping station.

LOWEST DIAMOND COST



Acker Diamond Bits are scientifically designed and set for economical, long lasting operation.

ACKER DRILL CO., Inc. P.O. BOX 830
SCRANTON 2, PA.

Over 40 years of experience manufacturing a complete line of diamond and shot core drills, accessories and equipment.

15 SIZES OF PACIFIC® SCRAPERS



U. S. A. Pat. No. 2716824 • Patented Canada 1957

Manufactured in Canada at Sorel, Quebec

Model	Size	Weight
2A	26"	480 lb.
2A	30"	510 lb.
2A	34"	550 lb.
AB	36"	775 lb.
AB	42"	850 lb.
AB	48"	960 lb.
AB	54"	1080 lb.
3B	36"	1400 lb.
3B	42"	1540 lb.
3B	48"	1730 lb.
3C	60"	2590 lb.
3D	48"	2030 lb.
3D	60"	2865 lb.
3D	72"	3700 lb.
3D	84"	4000 lb.

Scrapers are a specialty with us. Write today regarding your scraping problems. Send for Bulletin No. 287 giving specifications, complete information.

Use Pacific Sheave Blocks, Sheave Anchors, "Round-The-Corner" Sheave Blocks, Jaw Crushers, Bit Knockers and Pacific Wearing Parts.

ALLOY STEEL & METALS CO.

1848 East 55th Street, Los Angeles 58, California
Mailing Address: Box 58323 Vernon Station
Los Angeles 58, California



1. A model and size to suit every mining system.
2. In service in practically every mining area throughout the world.
3. They stand up under the toughest service conditions.
4. They help you move more muck at less cost.

Latin America

BOLIVIA—Nitro Boliviana Mining Company has purchased the Chacarillo copper mine where preliminary work and diamond drilling has been under way for about a year. Nitro Boliviana was formed by Nitro Metal Mining Company and Dow Mining Company of Japan to develop the property located near the Bolivian-Chile border and on the La Paz-Arica railroad.

MEXICO—Studies of the uranium (autenite) deposits discovered in the State of Mexico have shown such good results that the National Atomic Energy Commission has begun preliminary work for possible construction of a concentration plant.

BRAZIL—In connection with the move to develop the full mineral resources potential of Brazil, results of a study made by the Division for the Encouragement of Mineral Production have been published. One of the division's projects is preparing 33 geological sheets of the states of Ceara, Rio Grande do Norte, Paraiba, and part of Pernambuco. Three of the sheets, based on aerial photographs of the region, will be published in December. Another project of the division was a drilling program in Pernambuco, where a depth of 3,922 feet was reached in a search for phosphate. This was done in collaboration with the Coty Portland Cement Factory and the firm of Fosforita Olinda S. A. In Bahia, holes were begun at the Fazenda Aurora in Canavieiras to study the occurrence of sulphur. Drilling was also undertaken in the copper lodes at Caraiiba and in the galena lode at Santa Se. Pocos de Caldas, state of Minas Gerais, was the location for drilling of the uranium-bearing zircon ore lode at Taquari. Samples assayed 0.072 percent U_3O_8 . Specimens were taken of ten 50-ton lots of uranium-bearing zircon ore acquired by the National Nuclear Energy Commission for use in the sodium uranite plant to be built in that region. The division's work included processing of 125,393 tons of tantalite-bearing tin ore concentrate with electro-magnetic separators at the Nazareno plant in the vicinity of Sao Joao del Rei, Minas Gerais. In another area—between Conqueiros and Ribeirao de Pedra Branca and between Congo Fino and Nazareno—38,930,658 cubic yards of alluvium containing cassiterite, tantalite, and gold were removed and processed.

CHILE—Copper output for the first six months of 1960 totalled 246,483 tons, compared to 242,839 tons for the first half of 1959. Production for June was an estimated 38,764 tons, about 3,000 tons more than May.

BOLIVIA—The Bolivian dredge of South American Gold & Platinum Company is expected to reach its destination in the high-grade area of the Challana Playa soon. The dredge has produced some gold in the course of its diggings, but has not yet supported its own operations. Extremely difficult digging conditions, with large boulders and high bedrock, have been encountered. The company expects the dredge to contribute substantially to the firm's earnings, once it reaches the higher grade area.

PROFESSIONAL DIRECTORY

One-Inch Card, \$90 Yearly—1/2-Inch, \$60 Yearly, Payable in Advance.

CONSULTING ENGINEERS

BURBRIDGE—PYBURN
Consulting Engineers & Geologists
Mining—Petroleum
Southwestern U. S. & Latin America
Mills Bldg., El Paso, Texas—Tel. KE 3-4741

CHAPMAN, WOOD AND GRISWOLD
Mining Engineers & Geologists
P.O. Box 8302 Albuquerque, N. M.
525 Vernon Drive Vancouver 6, B. C.
Cable: CHAPWOLD

COWIN & CO., INC.
Mining Engineers and Contractors • Consulting
Appraisal Reports • Shaft & Slope Sinking • Mine
Development • Mine Plant Construction.
1-18th Street, S. W. Birmingham, Ala.
Phone ST 6-5566

C. P. KEEGEL
Mining & Metallurgical Engineer
Appraisal
1721 So. Fourteenth St. Tel. DUDLEY 4-6981
Las Vegas, Nev.

KELLOGG EXPLORATION COMPANY
GEOLOGISTS—GEOPHYSICISTS
Magnetic Seismic
Electromagnetic Radioactivity
3301 North Marengo Avenue
Altadena, California Sycamore 4-1973

**LOTTRIDGE-THOMAS
& ASSOCIATES**
Professional Engineers
705 Judge Building
SALT LAKE CITY 11, UTAH

MERRILL W. MacAFEE
CONSULTING ENGINEER
CHEMICAL-METALLURGICAL-MINING
LUdlow 3-1778 7668 Santa Fe Ave.
FRantier 5-6145 Huntington Park, Calif.

MESABI ENGINEERING
711 NEW YORK BLDG.
ST. PAUL 1, MINN.
CA. 4-8833
MECHANICAL ENGINEERS, DESIGNERS,
CONSULTANTS
MECHANICAL EQUIPMENT FOR THE CONTRACT-
ING AND MINING INDUSTRY—ENGINEERED TO
SUIT SPECIAL JOB REQUIREMENTS

STILL & STILL
Consulting Mining Engineers and Geologists
Room 24 Union Block Prescott, Arizona

O'DONNELL & SCHMIDT
Mining Consultants
165 Broadway Tel. BArcley 7-6960
New York 6, N. Y. Cables: EXAMIMINES

NEIL A. RICE

Mining Consultant—Registered Engineer, Exam-
inations, Valuations, Mining Methods, Cost
Cutting Surveys, Mineral and Oil and Gas
leases.

512 E. Roanoke Ave. AMherst 5-7854
Phoenix, Arizona

WISSER AND COX

GEOLOGISTS—ENGINEERS

Investigations and consultation
RESOURCES—EXPLORATION—OPERATIONS
VALUATIONS—INVESTMENTS—UTILIZATION
55 New Montgomery St., San Francisco, California
YUkon 2-1436 cables: GEOLG

WOLFE & ASSOCIATES

Geologists
Exploration-Valuation-Mineralogy
6518 Ledbetter St., Houston 17, Texas
Tel. OLIVE 4-1322 Cables: WOLMAC

CHEMISTS, SAMPLERS, SHIPPERS' REPS

ARIZONA TESTING LABS
Chemists—Spectroscopists—Assayers
Box 1888 817 W. Madison Phoenix
Box 2508 1516 East 20 St. Tucson

ORE SHIPPERS' REPRESENTATIVES
at Smelters & Seaports
(Pacific Northwest)

Samplers Assayers
BENNETTS CHEMICAL LABORATORY, INC.
901 So. 9th Tacoma 5, Wash.
Est. 1913 Inquiries Welcome

THE COLORADO ASSAYING CO.
ASSAYERS, CHEMISTS and SPECTROGRAPHERS
Est. 1900
Gold and Silver \$2.50, Copper \$1.50, Uranium
\$7.50. Send for free copy of our Mineralogist
Pocket Reference Giving Detailed Information on
all Principal Ores.
2244 BROADWAY—ALSO P.O. BOX 298
DENVER 1, COLORADO

DICKINSON LABORATORIES, Inc.
Assayers—Chemists—Metallurgists—Umpires
Shippers Representatives at Local Smelters
Representatives at Mexican Border
Points for Shippers of Manganese and Fluorspar
P.O. Box 7006 El Paso, Texas

ASSAYS. Complete, accurate, guaranteed. Spectra-
graphic. Over 55 elements including rare earths and
radioactives. \$8. REED ENGINEERING. 620-Y So.
Inglewood Ave., Inglewood 1, Calif.

Wood Assaying Co., Henry E.
Established 1878
ASSAYERS and CHEMISTS
733 W. Colfax Denver 4, Colorado

DRILLING COMPANIES

DIAMOND DRILL

Contracting Company

5. 18 Stone, Spokane 31, Wash.

- "SUPER PIONEER"
hand portable core drills
- "K & S INTERNATIONAL"
standard surface drills
- "DIA-HARD" Core Barrels
- And a complete line of "Super Pio-
neer" and standard diamond drilling
accessories.

R. S. MC CLINTOCK CO.
Diamond Core Drilling
Diamond Core Bits & Accessories
Spokane, Wash. Globe, Arizona

VAUGHAN DIAMOND DRILLING

World-Wide Consultants
Foundation, Grouting, Core Drilling, Wedging and
Recovering Hole. We are in the Business for
Trouble and have Experienced Trouble-Shooters
for every job.
Head Office: Beaverdell, B. C., Canada
Cable: VAUGHAN

WINK CORPORATION

Over 25 Years Experience in
North and South America
Diamond Drilling Contractors and Consultants
Minerals, Dams, and Masonry
F. W. Wink, Pres. Gordon Coristine, VP
133 So. Linden Ave. So. San Francisco, Calif.
June 3-9150 POlar 1-1941

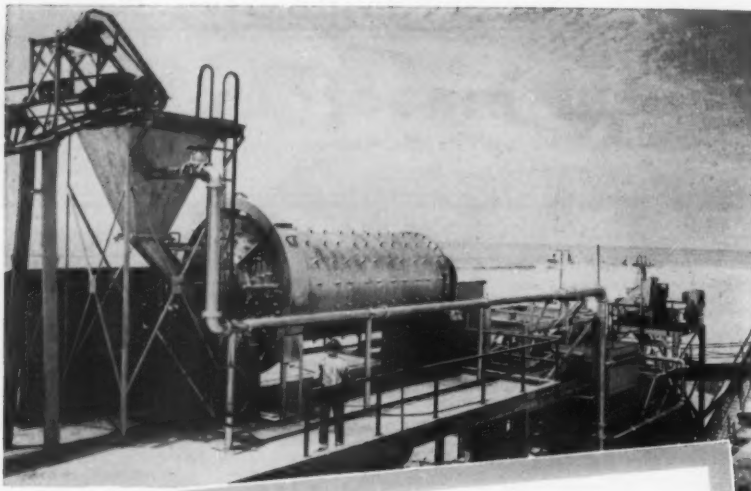
Longyear

Consultants to the
mineral industry

Evaluation—Exploration
Development
Mine Layout—Management
Photo Interpretation
Negotiations—Lease Counsel
Market Surveys
Mineral Venture Management

E. J. Longyear Company

76 S. 8th St. Tel. FE 9-7631
Minneapolis 2, Minn. Cable: LONGCO
70 Pine Street 409 Colorado Bldg.
New York, N. Y. Denver, Colorado
Tel. WH 4-8865 Tel. AM 6-1941



in scrubbers
it's the effective scrubbing
that counts!

the Marcy principle* of
small diameter, long length gives

- longer retention time
- more contact
- less short-circuiting

all with less horsepower

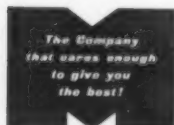
Heavy duty construction, operation on trunnion bearings, and properly designed drive, combine to eliminate vibration. And, with trunnion bearings, there is no maintenance problem due to corrosion and abrasion.

*Pioneered by Mine and Smelter and proven on tough iron ore cleaning problems.

for complete details on

Marcy Heavy Duty Scrubbers

write to



MANUFACTURING DIVISION

MINE AND SMELTER SUPPLY CO.

Denver 16 New York 17 Salt Lake City 1 El Paso Albuquerque
3800 Race St. 122 E. 42nd St. 121 W. 2nd S. 1515 11th Ave. 701 Haines N.W.

LICENSED MANUFACTURERS AND SALES AGENTS in Canada, Australia, Sweden, England, South Africa
Sales Agents in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the U. S.

WHAT'S GOING ON... INTERNATIONAL

MEXICO—A joint venture to reopen the old La Constancia mercury mine has been started by Nomura Mining Ltd., Mitsubishi International, and Associated Metals and Minerals Corporation. The mine is located in the municipality of Guadalucaza, San Luis Potosi.

DOMINICAN REPUBLIC—Negotiations under way mean the export of up to 20,000,000 metric tons of Dominican iron ore to Japan. The Japanese firm, Ashi Kogyo, is said to be interested because of the ore's high iron content which runs to 65 percent. **Explotacion Minera Hatillo** recently contracted to export 800,000 tons of Dominican ore to **Ferrostaal AG** of Essen, West Germany.

BOLIVIA—Part of the Taminani llamparas deposit is being mined by Cesar Grillo to obtain wolfram. The tungsten content is only 0.02 per cent in gravel and breccia combined. Washing is done in sluice boxes and the material is handled by bulldozers. The final product for exportation contains 70 to 72 percent WO_3 .

MEXICO—The Mexican government has launched an inventory of the country's iron and coal reserves in an effort to expand the steel industry. By 1965, steel production is estimated to total 3,300,000 annual metric tons, but increasing consumption will still leave a production deficit of about 1,000,000 tons.

JAMAICA—Expansion of operations, particularly near Connors in the Gellas Gate area, has been the subject of discussion between government officials and representatives of **Jamaica Copper and Iron** and **Jamaica Mining** companies. Prospecting permits have also recently been issued for iron ore, manganese, and china clay. **Jamaica Mining** was formed in 1956 by **Mogul Mining Corporation** and **New Consolidated Canadian Exploration**.

VENEZUELA—Rather extensive bauxite deposits have been located in the Gran Sabana area of Bolivar state but the grade of the ore has not been determined. Smaller deposits, estimated at 1,800,000 tons, have previously been found in other parts of the state and in Delta Amacuro territory. **Reynolds Metals Company** of the United States and other foreign groups have indicated interest in building a bauxite processing plant. Requests have been made by Canadian, Italian, and Japanese interests to the Venezuelan Minister of Mines and Hydrocarbons regarding development of natural resources of Guyana.

MEXICO—**Super-Fosfatos Hooker, S. A.**, subsidiary of **Hooker Chemical Company**, has begun photo-geologic studies to investigate phosphate deposits in the Gomez Farias Section of Coahuila.

BRAZIL—A study of additional exports of boron and manganese ores, mica and other raw materials to the United States is being undertaken by a United States Trade Mission to Brazil. Because of Brazil's growing needs for industrial expansion, the United States export potential will be directed toward production equipment, raw and semi-fabricated materials.

Europe

SCOTLAND—The Weardale Lead Company Ltd. is continuing to open up reserves, and drilling has indicated that mineral persists in depth below the 42-foot level. Sales in metallurgical grade fluorspar have increased some 50 percent and in refined grade about 25 percent over the same period last year. These factors have resulted in a decision to replace the obsolete and expensively operated gravity mill with a heavy media separation plant that will cost about \$80,000. Advantages that will accrue from this modernization are believed to be well worth the investment.

SPAIN—Eight Spanish companies—Altos Hornos, Echavarria, Mieres, Morada, Duro-Felguera, Ensidesa, Nueva Montana and Quijana—now have integrated steel plants which include coke batteries, blast furnaces, open hearth furnaces and rolling mills. At least three of the firms are again purchasing iron ore or negotiating for new contracts. The iron ore mining picture here is improving, with slightly increased prices. A committee of Spanish businessmen, including the head of the Ministry of Commerce Foreign Trade Department, visited Poland recently, with the result that trade with eastern countries will probably be greater than the 35,000 tons of iron ore which Poland bought from Spain last year.

YUGOSLAVIA—Production at the Kraljevo magnesite-chromite plant in central Serbia will be increased 100 percent by the end of 1961, as will the out-

put of mines supplying the factory. Main products of the 10-year-old plant are calcined magnesite and chrome-magnesite fire-resistant bricks used in steel works, foundries and smelting plants. Output this year will be about 80,000 tons of magnesite and 34,000 tons of bricks. Some 55 percent is exported. The expansion, which entails an investment of about 3,500,000 dinars, will include establishment of an institute for fire-resistant materials which is to be completed within five years. Chromium ores come from several Macedonia chrome mines, while magnesite is supplied by the nearby Bela Stena mines, as well as the more distant Sumadkija and Goles mines.

UNITED KINGDOM—Richard Thomas & Baldwins Ltd. will install six Head Wrightson rotary dryers for an iron ore drying plant, three at the company's Redbourne Works and three at the Spencer Works. Each installation will be able to handle a weekly output of 21,359 tons of ore, processing from 0 to 2½ inches. The highly-instrumented dryers are arranged in parallel flow and each has a capacity of 50 tons per hour when drying from 20 percent moisture down to 9 percent.

NORWAY—Because of promising results obtained by an aerial geophysical survey in the district of Finnmark in north Norway, a drilling program will be started.

SPAIN—The government has reserved prospecting rights in several mining areas in the Caceres region on all minerals except hydrocarbons in three zones; on lignites in Arenas del Rey and on iron, lead, zinc, silver, and barium in Almeria.



Kiruna Truck Cuts Mine Transportation Costs

A one and a half year test period in the iron mines of northern Sweden has proved this small underground Diesel truck a valuable contribution to modern mining techniques. Called the Kiruna truck, it was designed by Mining Transportation AB for maximum mobility and minimum maintenance and repair. Equipped with a low body, the Kiruna truck is made to carry a heavy load in difficult driving conditions because of its big wheels, low center of gravity, and weight-load distribution that puts more than 50 percent of the total weight on the driving axle. Its mobility and articulated design permit its use in a crosscut or drift of small size. Used in mines with ramps, the truck can drive straight from the face to the crushers without reloading and can haul from several stopes on different levels. Its versatility and loading capacity allow reduction in the number of vehicles necessary for mine operation. Because of two drivers' seats opposite each other, the truck has, in effect, five gears forward and five in reverse, since the driver simply steps over into the other seat when he wishes to go in the reverse direction. Capacity is 13.7 long tons; or 194 cubic feet; maximum loaded speed, 15 miles per hour; climbing ability with full load, 1:10 to 1:7; turning radius 22.5 feet; width, 7 feet, 10 inches; length, 20 feet 5 inches; and height, 6 feet, 5 inches. The four-cylinder Bolinder-Munktel engine is 70 horsepower, steering is hydraulic, and brakes are compressed air actuated.

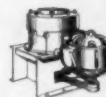


Laboratory Equipment



4" x 6" Massco Laboratory Jaw Crusher

Welded steel frame; manganese steel jaw and cheek plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear and product size by convenient hand wheel adjustment.



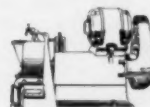
6" and 10" Massco Gy-Roll Reduction Crusher

Reduces ½" feed to as fine as 10 mesh in single pass. High capacity, low power consumption.



Laboratory Crushing Rolls

Sizes (Diameter x width): 8" x 4", 10" x 6", 10" x 8", 12" x 10" and 12" x 12". Adjustable roll space setting up to ¾". Double V-belt drive. Heavy, cast Meehanite frame absorbs vibration, results in long life.



Massco-McCool Pulverizers

Disc type grinder with a planetary movement. No gears. Will grind ¼" to 150 mesh in one pass.



Marcy Pulp Density Scale

Gives direct reading of weight; specific gravity of liquids, pulps, and dry solids; percent solids in pulp. Very accurate. Easy to clean.

MINE AND SMELTER SUPPLY CO.

3800 RACE STREET • DENVER, COLORADO
OFFICES AND AGENTS IN PRINCIPAL CITIES

65 YEARS OF SUCCESSFUL DRILLING FOR FIVE MAJOR INDUSTRIES...



Boyles Bros. drilling service, involving the newest techniques and modern equipment, is available through eight convenient locations. Contact us about your plans for exploration, shaft sinking, rock breaking, grouting, tunnel driving, mining and quarrying.

Mine Plant Design and Fabrication

Write for details

Boyles Bros.
DRILLING COMPANY

GENERAL OFFICES:
Salt Lake City, Utah.....HUinter 7-7595
BRANCHES:
Phoenix, Arizona.....CRestwood 4-5331
Sacramento, California.....IVanhoe 3-5221
Denver, Colorado.....ALpine 5-9244
St. Louis, Missouri.....PLateau 2-2544
Reno, Nevada.....FAirview 9-0732
Spokane, Washington.....WAlnut 4-2614
Alaska.....Contact Salt Lake City Office

Oceania

TASMANIA — Highest production in many years was achieved by Mt. Lyell Mining and Railway Company Ltd. in the 12 months ended June 30. Totals for this year and for 1959 were: ore milled, 1,986,533 and 1,939,173 long tons; copper concentrate produced, 52,170 and 44,915 tons; copper produced; 11,252 and 10,026 tons; silver produced, 38,370 and 21,369 ounces, and gold produced, 6,994 and 6,125 ounces.

REPUBLIC OF THE PHILIPPINES—Production of Atlas Consolidated Mining and Development Corporation during July totalled 4,748.4 dry short tons of concentrates which assayed 26.94 percent copper and 0.136 ounce of gold per ton. According to Col. Andres Soriano, Atlas president, the output was equivalent to 2,729,099 pounds of copper and 645.8 ounces of gold. Atlas shipped 5,736.4 dry short tons of copper concentrate from its mill at Toledo, Cebu, in July and 8,300 tons of iron concentrate from its Mati iron mines during the month.

WESTERN AUSTRALIA—Exceptional gold returns are still to be obtained from small mines being worked in the Kalgoorlie area, according to some recent examples. At the Sleeping Beauty mine at Ora Banda 179 ounces of gold were obtained from 388 tons of ore, and from the Rosemary lease at Mt. Monger the return was 235 ounces of gold from 165 tons of ore that was crushed at the State battery in Kalgoorlie. If sampling tests proved satisfactory, Western Mining Corporation will purchase the Sleeping Beauty for £40,000.

NEW GUINEA—During the fiscal year ended May 31 Bulolo Gold Dredging Ltd. produced 22,839 ounces of fine gold from 5,726,623 yards dredged and sluiced. The previous year's figures were 20,380 ounces and 4,903,098 yards. Increased yardage handled by Dredge No. 5 with added throughput at the Widubosh sluicing operation resulted in greater gross value for the year.

NEW SOUTH WALES—A mineralized zone under the city of Broken Hill which may lead to discovery of an ore body is being prospected by Broken Hill South Ltd. Diamond drilling rigs have been set up at Watertown Hill to the west, and on the South Mines leads to the east to drill into the new zone. The company has been given permission to enter about 1,100 acres of land. About 1,400 land owners will be involved in the project, but the work will not disturb the surface. Company surveyors believe the ore body will extend across the city from south to north. Any large ore body is expected to be more than 3,000 feet below surface. Discovery of an ore body would extend the life of the company, which is cut off from the present line of lode by the North Mine in the north and Zinc Corporation to the south.

WESTERN AUSTRALIA — Mineral concentration and separation plants of Westralian Oil Ltd. at Yoganup and Capel are working at full capacity producing high grade ilmenite and leucosene. Zircon, monazite, and rutile fractions are being stock-piled for future treatment. The first substantial order for 8,500 tons

of ilmenite was scheduled for shipment late in July. The market for ilmenite is steadily improving, according to company directors.

VICTORIA—Wattle Gully Gold Mines N. L., Victoria's oldest operating gold mine, is having difficulties because of continuing lower grade ore. Several holes have been drilled to find more ore, but nothing new has been revealed in the last four years. Discovered in the 1850's the field yielded about 7,000 ounces of gold weekly for a 10-year period. Production had ceased by 1880. It was reopened with little success in 1933. However, a payable load formation was encountered in 1936, and during the 24 years following the company paid £A720,000 in dividends.

NEW SOUTH WALES—Lake George Mines Pty. Ltd. is concluding an extensive exploration campaign at Captain's Flat. No significant discoveries have been made yet, but the state government has pledged assistance to continue exploration work. Failing further discoveries, present lead-zinc ore will last about two years if the company maintains full production at profitable prices.

QUEENSLAND—Dredging operations for Tableland Tin Dredging N. L. were expected to begin again in late August, after a two-month delay caused by bad damage to the digging ladder. The bottom end of the ladder has had to be replaced.

REPUBLIC OF THE PHILIPPINES—A 250-ton cyanidation plant at the Masara mill in Samar was put in operation by Samar Mining Company in July. The new plant treats free-milling gold ore from the Hijo mine reopened recently after being shut down since World War II. The Masara treatment plant now comprises two units, the cyanidation mill and a 250-ton-per day flotation plant to beneficiate copper-gold ore from the Hope mine. The company's iron mines in Sibuguey, Zamboanga del Sur, are now in operation and ore is being hauled for stockpiling. A road from the mine property to the pier was completed recently. First iron ore shipment of about 10,000 tons was made to Japan in late July.

QUEENSLAND—A sharp increase in ore production marked the start of a new financial year for Mt. Isa Mines Ltd. in July. Daily treatment rose 8,214 tons for the 24-day period ended July 24, or about 350 tons per day higher than the production rate last year. If this rate is maintained throughout the year, total ore produced will exceed 3,000,000 tons compared with 2,688,086 tons for 1959-1960. Production for the July period was: lead ore, 55,926 tons; lead bullion, 4,170 tons; zinc concentrate, 3,000; copper ore, 141,230; and blister copper, 3,450 tons. Concentrates railed for shipment amounted to 6,661 tons.

BICO-BRAUN—SINCE 1888



Manufacturers of
laboratory apparatus
for

QUALITY CONTROL.

Fred C. Bond

GRINDABILITY TESTS

3118 Valhalla
Burbank, Calif.

The Market Place

COMPLETE EQUIPMENT FOR ALL MINE AND MILL OPERATORS

CONCENTRATING TABLES
8-Dunham Economy Type Tables, 50" x 11'9" decks.
9-Doister super-duty diagonal deck standard tables

DIESEL-ELECTRIC GENERATORS
1-15 KW Waukesha-Hesselman
1-30 KW Buda
1-75 KVA Caterpillar, D-13000
1-112 1/2 KVA Caterpillar, D-17000
1-250 KVA Buda model 8D-CS-2505

AIR TUGGER HOISTS
1-Ingersoll-Rand Model DU
3-Ingersoll-Rand Model D6U
4-Ingersoll-Rand Model IH
14-Sullivan Model E-111
2-Ingersoll-Rand Model EUA
1-Ingersoll-Rand Model 10-H
4-Gardner-Denver Model MK
2-Joy "Turnbair" Model F-113
1-Sullivan Model L-111
2-Ingersoll-Rand Model 10HR
1-Sullivan Model HA 3
3-Ingersoll-Rand Model HU

AIR SLURSER HOISTS
1-Ingersoll-Rand Model HNNIJ
1-Sullivan Model FF-211
1-Sullivan Model F-212

ELECTRIC TUGGERS AND SLURSHERS
1-5 HP Sullivan, 2 drum slurshers
1-5 HP Sullivan Tugger
2-7 1/2 HP Sullivan tuggers
1-15 HP Ingersoll-Rand size 15NN-IG, 2 drum slurshers
1-30 HP Joy Double Drum Slusher
1-60 HP Sullivan 3 Drum Slusher
1-10 HP Sullivan A-312 3 Drum Electric Slusher
1-20 HP Sullivan AF-312 3 Drum Electric Slusher

BALL AND ROD MILLS
1-4' x 4' Marcy Ball Mill
1-4' x 4' Hirsch Ball Mill
1-64 1/2 Marcy Ball Mill
1-8' x 22' Hardinge Conical Ball Mill
1-3' x 8' Morse New Rod Mill
1-5' x 10' Denver Ball Mill

WE OWN WHAT WE ADVERTISE—ALL EQUIPMENT IN OUR DENVER STOCK WHERE INSPECTION CAN BE MADE

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd.

KeyStone 4-5261

Denver 1, Colorado

CRUSHING ROLLS
1-16" x 10" McFarlane
1-40" x 20" Cedar Rapids



JAW CRUSHERS
4-2 1/4" x 3 1/2" New Morse Lab Crushers
3-4" x 6" New Morse Lab Crushers
1-5" x 6" New Morse Jaw Crusher
1-6" x 7 1/2" Hendy Crusher
1-10" x 16" Gruendler Roller Bearing Jaw Crusher
1-10" x 20" Pacific Crusher
1-20" x 36" Diamond Roller Bearing, Steel Plate, Jaw Crusher

LOCOMOTIVES
1-1 Ton General Electric Battery Locomotive
3-5 Ton Atlas Battery Locomotives
2-5 Ton General Electric Battery Locomotives
1-4 Ton Westinghouse Battery Locomotive
1-4 Ton General Electric Trolley Locomotive
1-4 Ton General Electric Battery Locomotive
1-6 Ton Goodman Trolley Locomotive
2-6 Ton Jeffrey Trolley Locomotive
2-6 Ton General Electric Battery Locomotives
1-7 Ton Atlas Battery Locomotive
2-8 Ton General Electric Battery Locomotives
3-8 Ton Ironclad Battery Locomotives
1-9 Ton Whitcomb Battery Locomotive
4-10 Ton Atlas Battery Locomotives
2-10 Ton Jeffrey Trolley Locomotives
1-13 Ton Jeffrey Trolley Locomotive
1-13 Ton Goodman Trolley Locomotive
1-15 Ton Jeffrey Trolley Locomotive

FILTERS

1-3' x 4' Oliver Drum Filter.
1-3' x 6' Oliver Drum Filter.
1-4' x 2' Morse Drum Filter.
1-4' x 8' Elmcro Drum Filter.
1-6' x 3' Dorco Internal Type Filter.
1-6' x 2' disc Oliver Lead Filter.
1-6' x 5' disc Morse Lead Filter.

FILTER PRESSES

1-24" Shriver
1-36" Sweetland #12
2-4' x 10' Kelly

FEEDERS

2-24" Ross chain feeders, Type F. No. 2.
1-30" Challenge feeder.
1-32" Deco Challenge type.
3-18" x 14" belt ore feeders.
1-20" x 60" Alloy feeder screen.
1-10" x 36" Jeffrey Type 2A vibrating feeder.
1-36" x 36" Jeffrey No. 4 vibrating feeder.

FLOTATION MACHINES

1-1 cell Fagergren, 27" dia. type STD.
1-1 cell New Morse "Jetair" #7, 22" x 22" cell.
1-1 cell Fagergren, 36" x 36" cell.
1-2 cell Morse-Weinig, 37" x 37" cells.
1-4 cell Morse-Weinig, #15, 24" x 24" cells.
1-6 cell Stearns-Roger, 31" x 31" cells.
1-4 cell Denver Sub-A, #21, 38" x 44" cells.
1-6 cell Denver Sub-A, #21, 38" x 44" cells.
1-6 cell Fagergren, 36" x 36" cells.
1-2 cell Fagergren, 66" x 66" cells.

SCREENS

1-41" x 68" Jeffrey type FB-2 single deck vibrating screen
1-18" x 56" Jeffrey single deck conveyor screen
1-3' x 6' Robbins gyrax single deck
1-4' x 8' Robbins gyrax double deck
2-4' x 6' Allis-Chalmers single deck
1-4' x 12' Diamond double deck

MUCH OF THIS EQUIPMENT IS
LOCATED RIGHT IN NEVADA
CHECK IT WHILE IN LAS VEGAS

CLASSIFIERS

1-8" x 4'-6" Denver Laboratory, Spiral
1-4' x 15' Dorco Duplex Rake
1-36" x 12'-8" Denver Spiral

COMPRESSORS

1-2500 cfm Sullivan, Clam WN4, 2200 V.
1-315 cfm Ingersoll Rand Portable

CONVEYORS

1-60" x 150' Steel Frame 100 H.P.
1-42" x 1250' Link Belt, 2-100 H.P.
1-42" x 870' Link Belt, 200 H.P.

CRUSHERS

1-15" x 36" Universal, 50 H.P. 440 V.
1-10 x 20 Rogers Jaw Crusher, Roller Bearing
1-10 x 30 Pacific Jaw Crusher, 40 H.P.
1-4 x 6 Masco Lab. 3 H.P.
1-2 1/4 x 3 Braun Chipmunk, 2 H.P.
1-2 1/4 x 4 Braun Chipmunk, 2 H.P.

DIAMOND DRILLS

2-CP8 Chicago Pneumatic Hydraulic Head, V-8 Engine, Complete with Bean Pumps.
1-#15 Chicago Pneumatic, Air Powered
2-HS-15 Sullivan, Air Powered

FEEDERS

1-4' x 8' Jeffrey Vibrating, Type 5, 440 V.
1-36" x 8'-4" Link Belt, Aaron, 3 H.P.
1-36" x 72" Jeffrey Traylor Grimly Pan, 440 V.

FILTERS

1-6'-4" disc Elmcro Filter Complete
1-6'-5" disc American Filter, Complete

FLOTATION MACHINES

1-6 Cell #21 Denver "Sub A" Flotation
1-1 Cell #100 Denver Unit Cell

GENERATORS

1-50 KW Caterpillar D 8800, 220/440 V. Excellent
1-75 KW Caterpillar D 13000, 220/440 V. Excellent

HOISTS MINE SHAFT

1-40 H.P. Coeur d'Alene Jr. Single drum, Exc.
1-75 H.P. W. A. Box, Single Drum
1-200 H.P. Coeur d'Alene, Single Drum
1-600 H.P. Vulcan Wilkes Barre, Single Drum, 2300 V.



75 KW Cat. Diesel Generator

1-600 H.P. Vulcan Wilkes Barre, double drum, 2300 V.
1-675 H.P. Vulcan Wilkes Barre, double drum, 2300 V.

HOISTS, TUGGERS & SLURSHERS

1-AP-312 Joy, 3 drum air, 15 H.P.
2-HKE Gardner Denver, 2 drum air
1-CA 311 Sullivan, 3 drum 50 H.P. 440 V.
2-A5NNOH Ing. Rand, 2 drum, air
1-15 NM2F Ing. Rand, 2 drum, 15 H.P.
4-HU Ing. Rand Tugger, Air 2000# pull
8-HK Gardner Denver, Air 2000# pull
1-20 NM2C Ingersoll Rand, 2 drum, 440 V.
1-BF-312 Sullivan, 3 drum, 20 H.P. 440 V.
4-30NM3C Ingersoll Rand, 2 drum, 30 H.P. 440 V.
1-CF-211 Sullivan, 2 drum, 50 H.P. 440 V.

HYDROSEPARATORS

1-36" x 10' Process Engineers, Steel tank
2-24" x 8' Process Engineers, Steel Tank

JIGS

14-4 Cell 42" Yuba, M-8, 3 H.P.
1-2 Cell 42" Yuba, Model M-8
2-12" x 18" Denver Duplex
1-42" x 45" Bendalari, Duplex

LOCOMOTIVES

5-1 1/2 Ton Mancha Battery, 18"-24" ga.

WE'RE READY TO DEAL

MACHINERY CENTER, INC.

1201 SO. 6TH WEST

HU 4-7601

SALT LAKE CITY 10, UTAH

GET OUR LATEST CATALOGUE & LISTS

1-3 1/2 Ton Mancha AX Battery, 18" ga.
1-4 Ton Mancha "Elec. Mule," Battery, 24" ga. Exc.
1-1 1/2 Ton Atlas, Type J, 24" ga.
1-7 Ton Plymouth Diesel, 18" ga.

MILL

1-5' x 10' Marcy Ball Mill
6-8' x 8' Traylor Ball Mills
1-5' x 8' Traylor Rod Mill
1-3' x 8' Hendy Rod Mill

MUCKERS

5-12B Elmcro Mucking Machines, 18" ga.
5-GD9 Gardner Denver, 18" ga.
1-HLS Sullivan, 18" ga. Bargain

PULVERIZERS

4-Braun UA Laboratory, 440 V.

PUMPS, SAND

2-8" Dorco Duplex, Type W, 5 H.P.
3-6" Dorco Duplex, Type VM, 3 H.P.
3-6" x 6" Allis Chalmers, NR LOR, 30 H.P.
10-4" x 6" ASH Hydrosal, Frame B.

PUMPS

1-6" x 8" Fairbanks Morse #5814, 2000 gpm, 300 H.P. Regutron Controls
1-10" Yuba, Model AA, 2400 gpm, 15 H.P.
2-14" Yuba, Model AA, 5500 gpm, 25 H.P. & 250 H.P.
1-16" Wintroath deepwell, 2000 gpm, 100 H.P. Regutron controls.
2-16" Casende, Sump, Single stage, 7440 gpm, 30 H.P.

SAND WHEEL

4-12 1/2" x 4' Conveyco Duplex, Steel Tank

SCREENS

1-9' x 9' Deister Plate, 1 deck, 7 1/2 H.P.
1-9' x 54 1/2" Yuba Trommel, 60 H.P.
3-4' x 12' Tyler Ty-Rock #600
1-4 x 10' Tyler Hammer 1 deck
1-4' x 8' Symons Rod Deck

SHOWELS

1-17d. Bucyrus-Erie, 170 B. Electric
1-3 1/2 yd. Marion, 111, with Dragline
1-6 yd. Marion Model 7200 Walking Dragline, Diesel Electric

1-54B Bucyrus-Erie Dragline

THICKENERS

1-15' x 8' Denver Rake Thickener, Iron tank
1-38 1/2" x 8' Denver Spiral Rake, w/steel tank

Visit our Booth #7 at Las Vegas

AIR COMPRESSORS

INGERSOLL-RAND Model "ER", size 12x10, 304 CFM, 50 HP motor.
INGERSOLL-RAND Model "XCB", 2-stage, 782 CFM, 125 HP motor.
INGERSOLL-RAND Model "ER", size 9x8, 100 CFM, 25 HP motor.

AIR HOISTS

27-INGERSOLL-RAND, grooved pulley drums, 1000, 2000, 4000, 6000 & 10,000# cap.
22-THOR & DETROIT, 1000 & 2000# cap.
1-INGERSOLL-RAND Air Winch, Model "EUA", 1250# cap. @ 100 FPM.

BUCKET ELEVATORS

1-JEFFREY, 8"x5" buckets, 40'.
1-JEFFREY, 14"x7" buckets, 30'.
2-LINK-BELT, 18"x8" buckets, 55'.
1-LINK-BELT, 14"x8" buckets, 50'.

BELTING

2000'-18, 20, 24 & 30" rubber covered belting. NEW. AT DISCOUNT PRICES.

BELT CONVEYORS

LINK-BELT & JEFFREY 18, 24 & 30" wide. Flat or Trough idlers. Built to your specifications from used Trough Idlers, Head & Tail Pulleys, Motors & Drives, new Framework and new Belting.

CAR PULLERS

LINK-BELT 1-ton cap., 2 HP motor.
LINK-BELT 5-ton cap., 5 HP motor.

CLAMSHELL BUCKETS

2-BLAW-KNOX size 7151, 2-line, 1½ cu. yd. cap. LIKE NEW.
1-WILLIAMS 2-line, 1 cu. yd. cap.

CRUSHERS

JEFFREY Double Roll 20" x 18".
JEFFREY Swing Hammer, Model "B3", size 24" x 20".
AMERICAN Model S.T.T. #1700, 3000# per hour for turnings.

FEEDERS

4-JEFFREY Standard #5, 24" x 96".
1-SIMPLICITY Model OA-10A, 36" x 18'.
3-SIMPLICITY Model OA-10A, 36" x 10'.
2-SIMPLICITY Model OA-10-JA, 36" x 6'.
4-SIMPLICITY Model OA-10-JA, 36" x 12'.
1-SIMPLICITY Model OA-10-A, 36" x 25'.

PUMPS

INGERSOLL-RAND size 4 RT-4, 450 GPM, 1100' head, 4-stage, 200 HP motor & compensator.
INGERSOLL-RAND size 4HMT-4, 450 GPM, 539' head, 4-stage, 100 HP motor & compensator.
WORTHINGTON 30 GPM, 25 HP motor.
ALLIS-CHALMERS 4-stage, 150 GPM, 75 HP motor.

ROTARY DRYER

LINK-BELT Roto-Louver Type, Model #705-24, 7'-5" O.D. x 24' long. Complete w/6,000,000 BTU per hour gas burner air supply. In excellent condition.

AAA MACHINERY & EQUIPMENT CO.

Dept. M-1
10900 Cedar Rd.
Cleveland 6, Ohio
SW 1-3900

JUST PURCHASED

- 2-Bonnet 7' x 60' rotary dryers, ½" shell, fan, cyclone, burners
- 2-Bonnet 6' x 52'-6" rot. dryers, fans, cyclones, burners, etc.
- 2-Davenport 8' x 60' rotary dryers, 7/16" welded shell, complete
- 1-Louisville 7' x 70' rotary cooler, ½" welded shell, late model, complete

SEND FOR CIRCULAR #860-A

- 1-Vulcan 10' x 11' x 175' rotary kiln, 13/16" shell, 2-tire, firing hood, etc.
- 3-National Iron 10' x 78' rotary dryers, ¾" shell, excellent cond.
- 2-Hardinge 8'8" x 70' rotary dryers, ¾" welded shell, class #XA-18
- 1-Allis-Chalmers 7' x 50' rotary dryer, ¾"
- 1-Kennedy 7' x 9' contin. ball mill
- 2-Hardinge 7' x 36' conica pebble mills
- 5-JAW CRUSHERS: 36" x 15", 24" x 13", 20" x 6", 18" x 9", 8" x 10"

PERRY EQUIPMENT CORP.

1429 N. 6th St. Phila. 22, Pa.
POplar 3-3505

1-5'3" Dia. x 10' Face Oliver Continuous Vacuum Precoat Filter—Monel Construction (NEW-UNUSED).

1-3' x 8' Marcy E.P.D. Rod Mill.

1-5' x 9' Kennedy Ball Mill.

1-50 KW Century AC Generator, 3/60/127/220/440—1200 RPM: Model 6-HGA Cummins Diesel Engine.

Muckers, Generators, Compressors, Conveyers, Transformers, Motors, Tunnel Forms, Drills, Hoists, Pumps, Locomotives, etc.

MACHINERY RESERVE OF DENVER

730 West 42nd Ave., Denver 16, Colorado
Cable: "Marod" Phone: GL 5-9419

CORE DRILL SPECIAL. Bargain prices. One new hydraulic operated core drill, will angle drill, rated 800 ft. One used core drill, trailer mounted, rated 400 ft., with Chevrolet 1½ ton service truck, complete equipment for 200 ft. operation. Also smaller core drills. Good used trucks for mounting equipment. Advise your needs. Contact Pressey & Son, Pueblo, Colorado.

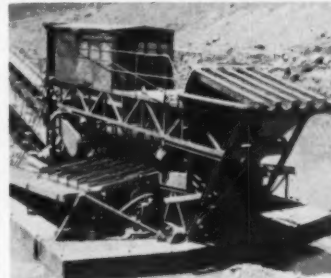
WOOD TANKS

for Every Purpose



Since 1885

Pipe Cooling Towers
And Engineered Wood Products
GEORGE WINDELER CO. Ltd.
2229 Jerrold Ave., Valencia 4-1841
SAN FRANCISCO 24, CALIFORNIA



FOR SALE—Gold Mining Dredge complete with accessories, lighting plant, 10" pump, and 65-HP GMC diesel motor. Location Nevada. Compactness permits ready shipment. Price \$20,000. For purchase or additional information write attention I. R. Lunt, Rogers Engineering Co., Inc., 16 Beale Street, San Francisco 5, California.

Crusher 20x36 Universal rlr-brg
Crusher 15x30 Buchanan Blake type
Crusher 10x20 Denver Eq. rlr-brg
Crusher 9x16 Denver Eq. rlr-brg
Crusher 10x16 Denver Eq. Co.
Crusher 5 hp McFarlane-Eggers sampler
Samplers 60" and 28" standard Vezin
Magnet 40" dia. Stearns w/rectifier, etc
Bins Six 100 ton cap.
Feeders Six 2 hp recip.-plate ty. 36" wide
Dust Control System: Wheelabrator #17 Model 112, with 25 hp blower, etc.
Rod Mill 4x10 Hardinge: periph. end dis.
Ball Mill 5 ft. dia. x 6 ft. Colo. I. Wks
Classifier 8'x21'8" Dorr DSF duplex
Flotation 6 Wemco-Fag 56x56; V-belt-dr.
Filter 3-leaf 6 ft. American w/vac. eq.
Thickener 28x10 Dorr, low-head, steel tank
Triple Roll Crusher 30x18 Pioneer
Two Roll Crusher 42x16 Allis-Ch.
Mancha 5-6 Ton Ty. AN bat. loco, 24" ga.
Mancha Two 1½ Ton 18/24" ga. locos.
Mucker 12-8 Eimco; late type.

Paul F. Smith

39 W. Adams St. Phoenix, Arizona

FEDERAL PIPE & TANK CO.

Ore Bins
Tailings Pipe
6851 E. Marginal Way
Seattle 8, Wash.

8' Gayco Air Separator W/Motor
24"x95' Hewitt Robins Belt Conveyor New
2-5'x8' Kennedy Van Saun Air Swept Ball
Tube Mills with disc feeders, fans, piping.
4½'x9' KVS Air Swept Ball Mill
2 Wemco 2M—HMS Plants
6'x4' & 6'x9' Traylor Ball Mills
No. 56 and 7'x13' Marcy Ball Mills
10'x48" & 6'x36" Hardinge Ball Mills
4'x11" & 7'x15' Marcy Rod Mills
18'x36" & 15'x24" Rogers RB Jaw Crushers
14'x28", 30x36 & 48'x72 Jaw Crushers
78"x36'6" Akins Duplex Spiral Classifier
5'x30' Ruggles Coles Rotary Drvr
8'x60' Rotary Dryer ½" Welded Shell
3'x30', 9'x162' Allis Chalmers Rotary Kilns
8, 12, 23, 25, 45, 60 & 100 ton GE & GM Diesel Electric Locomotives
25 ton Ind. Bm. Hoist Dsl. Loco. Crane
6-2200 & 3078 Ingersoll Rand Elec Compressors
DARIEN, 60 E 42nd Street, N.Y. 17, N.Y.

Sales Engineers at Las Vegas

continued from page 69

Traylor Engineering and Manufacturing Division, Fuller Company (211) A. Jamieson, R. F. Miller, A. C. Most, C. H. Roberts.

Twin Disc Clutch Co. (1312-1314-1316) Art Belcher, W. B. Gibson, Robert Phillips, Joseph Snoy, Pierce Tyrrell, Jack N. Yetter.

The W. S. Tyler Company (227) Fred Braun, E. T. Jeffery, Ned Kuenhold, A. E. Reed.

Union Wire Rope Corporation, Subsidiary of Armco Steel Corporation (1420) D. E. Bedford, R. B. Boand, C. H. Conley, R. K. Erickson.

United States Steel Corporation (407-411) sales representatives.

United States Steel Corporation, Ammonium Nitrate Division (1617) F. E. Adams, C. R. Berry, C. W. Bourg, D. M. Stromquist.

Universal Engineering Corporation (242) C. M. Bindner, R. P. Cardew, V. Carrier, C. W. Gustafson, J. P. Heihn, H. J. Knudten, R. F. Murray, T. A. Oberhellmann.

Varel Manufacturing Company (1514-1516) John P. Millet, Bill Porter.

Vascoloy-Ramet Corporation (234) H. Bastian, E. C. Lomax, B. J. Naden, C. Neamand.

Victaulic Company of America (347) F. A. Anger, S. D. Chilcote, R. W. English, J. E. St. Clair, H. D. Squibb.

Vulcan Iron Works Company (1320) C. W. Hawn, J. H. Jett.

Wagner Mining Scoop, Inc. (53) R. T. Wagner.

WEMCO, Division of Western Machinery Co. (335-434) R. S. Bailey, C. E. Golson, D. W. Jenkinson, E. V. Martz, W. D. Michaely, P. H. Mulcahy, D. E. Newton, W. H. Newton, W. H. Reck, F. V. Schneider.

Werco Steel Co. (123) Thomas E. Bridgewater, Russell O. Webster, George Wood.

Western Contracting Corporation (29) H. H. Everist, Sr., H. H. Everist, Jr., L. Garland Everist.

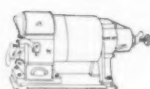
Western Rock Bit Manufacturing Co. (219) Thomas C. Bennett, Maurice W. Hawkesworth, Horace U. Siegel.

Westinghouse Electric Corporation (310) Darrell Searls and technical personnel.

Wheelabrator Corporation (1510-1512) L. L. Andrus, K. E. Blessing, G. W. Roper.

Wink Corporation (52) Gordon Coristine, F. W. Wink.

BICO-BRAUN — SINCE 1888



Manufacturers of
laboratory apparatus
for
QUALITY CONTROL.
Direct-driven-one
pound quartz ore
one hundred mesh
in one minute.
3118 Valhalla
Burbank, Calif.

W. R. WADE CONSULTING MINING ENGINEER



MARIETTA GOLD MILL

(Under construction, now operating)

(E. PLURIBUS UNUM) WADE MILLS

A difficult arsenic-gold separation solved at this mill
30 years experience with metallurgical problems,
designing and building mills

W. R. WADE Marysville, Montana Telephone Helena HI 2-0105
CABLE WADE Helena, Montana

- ★ Connecting Wire
- ★ Bus Wire
- ★ Leading Wire
- ★ Shot Firing Cord

IT'S COLEMAN
FOR

BLASTING WIRE

WRITE FOR
SAMPLE CARD!

COLEMAN

Cable & Wire Co.

1910 N. River Rd.

River Grove, Ill.

Tel. (Chicago) NAtional 5-6215

WORLDWIDE

PROFESSIONAL DIRECTORY

COOKE, EVERETT & ASSOCIATES CONSULTING GEOLOGIST

Examinations—Exploration—Research
Photogeology—Valuations—Surveys

P. O. Box 2229 Reno, Nevada, U. S. A.
Telephone: FAirview 9-1766
Cable Address: COVER

ABBOT A. HANKS, INC. ESTABLISHED 1866

ASSAYERS—CHEMISTS—ENGINEERS

Supervision of Sampling at Smelters and Shipping Points

Control and Umpire, Assays
SPECTROGRAPHIC ANALYSIS
Inspection and Tests of Structural Materials
1300 Sansome Street SAN FRANCISCO 11
Telephone EX 7-2464 Cable Address: HANX

GEORGE H. NEWMAN Consulting Geologist

Registered Mining Engineer
Specialist in the Philippines
P.O. Box 2418 Manila, Philippines

HARRY B. CANNON ASSOCIATES Geologists — Engineers

Exploration Ore Dressing
Specialists in Heavy Minerals
P.O. Box 2432 Lakeland, Florida

CLASSIFIED ADVERTISING

Sales Engineer Wanted

Prominent mining journal has need for a man with good mining or metallurgical background. Position requires emphasis on personality, appearance and pronounced aptitude for sales and good public relations. Must also be qualified for technical writing. Excellent starting salary with opportunity for steady advancement. Also fully paid expense travel. Position involves work of unusual interest and opportunity for the right man. Midwestern location. Write or wire Box K-1, Mining World, 500 Howard Street, San Francisco 5, California.

FOR SALE OR LEASE—Large deposits of high-grade Silica (SiO_2) 99.84% pure. Iron-Magnetite, Hematite, 59% Rose Quartz. Fertilizer deposit. Building stone, colorful, highly banded Wonderstone. Phone or write BRADY JEWELERS, Tehachapi, Calif.

FOR SALE—Thirteen acres near Rosamond, Kern County, Calif., containing silica feldspar mine and crushing plant. Furnish aggregates for exterior wall panels. Shows good profit every year. Business can be enlarged. Nice two bedroom home, water, power, telephone, near paved road. \$25,000. \$10,000 down. Owner retiring. P. O. Box 445, Rosamond, Kern County, Calif.

OXIDIZED COPPER deposit wanted where all mining is to be performed by power shovels in open pit. Should represent potential of one million or more tons assaying 2% Cu or better. Send particulars addressed Mining Operator, P. O. Box 1022, Reno, Nevada.

TELLURIUM DEPOSIT NEEDED—Prefer deposit with huge possibilities. Siskon Corporation, 125 N. Center Street, Reno, Nevada.

ASBESTOS—Financial backing wanted to explore and develop potential deposit. Fiber exposed around plateau rim. Average drilling depth 60'. P. O. Box 407, Globe, Arizona.

FOR SALE—One used AMSCO industrial dredge pump, style P-180N, 10", Type T, frame 238X, HC-250 wearing parts; complete with overhead motor platform, V-belt guard and 7-groove "C" section 20-0" P.D. Sheave-less motor, motor sheave and V-belts Two used Hazelton Type "CT" 8" dredge pumps with Ni-Hard wearing parts, fitted with 8-groove "C" section 20-0" P.D. Sheave, overhead motor mounting base and V-belt motor guard, less motor, motor sheave and V-belts. All pumps are in excellent condition. Pima Mining Company, H. E. Eckstein, Purchasing Agent, P. O. Box 7187, Tucson, Arizona.

FOR SALE—320 acres in South Idaho. Should be prospected. Reportedly 6 to 8 foot vein there. Situated at foot hills of Continental Divide. Write P.O. Box 394, Lewiston, Montana.

Index of Advertisers In Mining World

*Asterisk indicates firms whose products are catalogued in MINING WORLD's 1960 Catalog, Survey & Directory Number

A	K
*Acker Drill Company, Inc. 102	*Keeney Co., Paul E. 97
*Alimak Corp. 83	*Knapsack-Griesheim 4
*Allis-Chalmers 20	*Krupp Maschinen-Und-Stahlbau, Fried 8, 9
*Alloy Steel & Metal Co. 80, 102	
*American Manganese Steel Div. 26, 27	L
*American Mine Door Co. 90	LeBus International Engineers 10
*American Smelting & Refining Co. 11	*Libu Shovel Co., AB 76
*American Zinc Sales Co. 98	*Lima Div., Baldwin-Lima-Hamilton 24
*Anaconda Company, The 28, 29	*Longyear Company, E. J. 90
*Asea Electric Inc. 17	
*Atlas Copco 1	M
B	*Mace Company 98
*Baldwin-Lima-Hamilton, Lima Division 24	*Magma Copper Company 98
*Barber-Webb Co., Inc. 91	*Marion Power Shovel Company 81
*Bean Div., John, Feed Machinery & Chemical Corp. 91	*Mine and Smelter Supply 104, 105
*Bemis Bro. Bag Company 89	
*Bico-Braun 106, 109, 110	N
*Boyles Bros. Drilling Co. 106	*National Iron Company 16
*Boyles Bros. Drilling Co. Ltd. 21	*National Malleable & Steel Castings Co. 25
*Brunner & Lay, Inc. 100	*Nordberg Mfg. Co. 22, 23
*Bunker Hill Company 101	
*Brom Machine & Foundry Co. 84, 85	P
C	Pacific Foundry and Metallurgy Co. 96
Caterpillar Tractor ... Inside Back Cover, 2	
Colman Wire & Cable Co. 109	S
*Colorado Fuel & Iron Corp. 88	Sanford Day Iron Works 30, 31
D	*Smith & Co., F. L. 32
*Deister Concentrator Co., Inc. 83	*Spang & Company 95
*Denver Equipment Co. 86	*Sprague & Henwood Inc. 92
*Denver Fire Clay Co. 13	*Stanco Mfg. & Sales Inc. 70
*Diesel Energy Corp. 87	
F	T
Fairchild Aerial Surveys Inc. 99	Thermoid Div., H. K. Porter Co. 79
G	*Traylor Engineering & Mfg. Div. of Fuller Co. 82
*Gardner-Denver Company 18	*Treadwell & Co., M. H. 19
*General Cable Corp. 72, 73	
*Getman Bros. 12	W
*Gripheist 101	*Warn Mfg. Co., Inc. 92
H	*Western Knapp Engineering Co. Inside Front Cover
*Harnischfeger Corp. 14, 15	*Western Precipitation Corp. 74
*Hazemag 93	*Wilfley & Sons Inc., A. R. Outside Back Cover
*Houston Tool Co. 98	
*Hughes Tool Co. 6	MARKET PLACE
I	AAA Machinery & Equipment Co. 108
*Inspiration Consolidated Copper Co. 101	Darian 108
International Nickel Company, Inc. 71	*Federal Tank & Pipe 108
International Smelting & Refining Co. 101	*Machinery Center Inc. 107
Isotopes Specialties 78	Machinery Reserve Of Denver 108
J	Morse Bros. Machinery 107
*Joy Mfg. Co. 3	Perry Equipment 108
	*Pressey & Son 108
	Rogers Engineering 108
	Smith, Paul 108
	*Wade, W. R. 109
	*Windler Co. Ltd., George 108

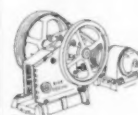
ASSAYER—Experienced. Routine analysis for copper mining company near Tucson, Arizona. Write P.O. Box 7187, or call Mr. Rich, AX 4-1447 between 8 a.m. and 4:30 p.m.

FOR SALE—Largest copper producing mine in Contact district, Elko county, Nevada. Leo R. Bricker, Contact, Elko County, Nevada.

FOR SALE—Joy 22 HD core drill, custom built, rated 2000'. Hardly used—drilled only 8500'. Mounted on GMC, 4300 actual miles. New Ford 6 and 4 industrials power drill and 4x5 GD pump. Immaculate and operationally perfect throughout. Cost \$17,718. Only \$6500. Hamlin Mining Company, Midwest, Wyoming.

FOR LEASE—Placer Gold claims, Esmeralda County, Nevada. Undeveloped but preliminary examination indicates substantial amounts of commercial gravel. Water well and camp houses developed. Contact Mrs. B. Whitaker, 214 No. California St., Lodi, Calif.

BICO-BRAUN—SINCE 1888



Manufacturers of laboratory apparatus for
QUALITY CONTROL.
CHIPMUNK CRUSHER
2 1/2" quartz to 1/4" chips at rate of 800 lbs. an hour
3118 Valhalla
Burbank, Calif.

REPORT FROM VITRO MINERALS CORP., RIVERTON, WYOMING



ADVERSE GRADE OUT OF PIT IS 6 TO 10% —but DW20G averages 4-minute cycles on 1-mile round-trip haul!

This Cat DW20G-456B rig is one of four used by the Vitro Minerals Corp. to strip overburden from uranium ore near Riverton, Wyoming. Notice the adverse grade out of the pit. Even under such unfavorable conditions, this unit makes a mile round trip in 4-minute cycles with an 18-yard payload of sand with high clay content—up to 270 yards an hour.

Here is just one of hundreds of examples where the power, speed and stamina built into the DW20G pay off on the job. You can count on it for high, steady production day in and day out.

With 345 horsepower stepping up rimpull 12%, the DW20G travels up to 20% faster than the previous model—even with the greater load capacity (19.5 cu. yd. struck) of the new 456B LOWBOWL Scraper.

Caterpillar SynchroTouch Transmission Control is optional—the operator simply dials the speed he wants. Split-second, touch-and-go response cuts cycle time—brings in more payloads per hour.

Call your Caterpillar Dealer and get the whole story on how the tough, dependable DW20G can step up production and profits on your jobs!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

**HAUL AT LOWEST
COST PER CU. YD.**

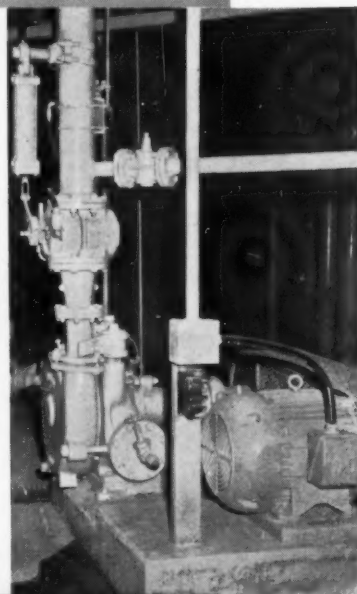
CHIPS ARE DOWN . . .

IT'S DEPENDABILITY

WILFLEY SAND PUMPS

When production schedules are tight, and economy a vital factor, put Wilfley Sand Pumps on the job. Wilfley's 24 hour, trouble-free operation reduces downtime to an absolute minimum. Rugged construction, simplified packingless design and Wilfley's easy parts replacement guarantee you dollar-saving dependability even under the most severe conditions.

Wilfley Sand Pumps may be fitted with interchangeable electric furnace alloy iron, special application alloys or rubber-covered wear parts. Write, wire or phone for complete details.



Every Wilfley Installation Is JOB ENGINEERED

A. R. WILFLEY AND SONS, INC.

1000 E. 10th St., Dept. 100, Tulsa, Okla. 74103
Phone: (918) 438-1234

